Deval L. Patrick, Governor
Timothy P. Murray, Lt. Governor
Jeffrey B. Mullan, Secretary & CEO
Luisa Paiewonsky, Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

January 31, 2011

Subject: **Rehabilitation of the Anderson Memorial Bridge**
Bridge No. B-16-011=C-01-007
North Harvard Street over Charles River, Boston – Cambridge
MassDOT Project No. 605517

Dear Reviewer:

On behalf of the Massachusetts Department of Transportation (MassDOT), we are pleased to provide a review copy of the Environmental Notification Form (ENF) for the Rehabilitation of the Anderson Memorial Bridge Project. The goals of the project are described in the transmittal letter to EEA Secretary Sullivan and in more detail in the attached ENF.

The ENF will be noticed for public review in the Environmental Monitor on February 9, 2011. The public comment period associated with the ENF review is 20-days. Comments on this project are due by March 1, 2011.

If you submit written comments on the ENF, please include a return address to facilitate future correspondence. Written comments on the ENF should reference the project's name, and be sent to the Executive Office of Energy and Environmental Affairs at the following address:

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
[Analyst Name], EEA No. [#####]
100 Cambridge Street, Suite 900
Boston, MA 02114

Please send a copy of your comments to:

MassDOT, Highway Division
Environmental Services
Attn: Beth Suedmeyer
10 Park Plaza, Room 4260
Boston, MA 02116-3973

Sincerely,

Kevin M. Walsh
Director
Environmental Services

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

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January 31, 2011

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Dear Secretary Sullivan,

We are pleased to submit the attached Environmental Notification Form (ENF) for the rehabilitation of the Anderson Memorial Bridge. This project is part of the Massachusetts Department of Transportation's (MassDOT's) Accelerated Bridge Program. Built in 1915, the Anderson Memorial Bridge carries North Harvard Street over the Charles River connecting Boston and Cambridge.

The 95-year old bridge is structurally deficient and deteriorating; necessitating rehabilitation to meet the current multi-modal transportation needs and extend the structural life. The need for structural rehabilitation of the bridge is being approached by MassDOT as an opportunity to improve universal accessibility and pedestrian and bicycle connections around the bridge, as well as overall enhancements to the parkland in the vicinity of the project.

MassDOT has initiated a wide-reaching dialogue with neighborhoods, businesses, Harvard University, civic associations and agencies impacted by the construction to discuss design and construction options. To date a total of four informational meetings have been held in the City of Cambridge and the City of Boston.

The Charles River Reservation, owned and operated by the Department of Conservation and Recreation (DCR), borders the Anderson Memorial Bridge on all four quadrants. The structural repairs to the bridge will require temporary use of the DCR property during construction. Areas disturbed by the project will be carefully landscaped to tie the bridge into its historic setting and be consistent with DCR's *Charles River Basin Master Plan*. All aspects of the project design and construction, as they relate to the parkland, will be closely coordinated with DCR.

Thank you for your consideration of this critical public infrastructure and parks project.

Sincerely,

for Frank A. Tramontozzi
Luisa Paiewonsky
Administrator
Highway Division

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
■ **MEPA Office**

ENF Environmental Notification Form

For Office Use Only *Executive Office of Energy & Environmental Affairs*	
EEA No.:	14702
MEPA Analyst:	Deirdre Buckley
Phone: 617-626-	1044

The information requested on this form must be completed to begin MEPA Review in accordance with the provisions of the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: Rehabilitation of the Anderson Memorial Bridge			
Street: North Harvard Street over the Charles River			
Municipality: Boston & Cambridge		Watershed: Charles River	
Universal Transverse Mercator Coordinates: 4692927N 325183 E		Latitude: 42.368889 N Longitude: -71.123056 W	
Estimated commencement date: 12/6/2011		Estimated completion date: 9/10/2013	
Approximate cost: $24.5 million		Status of project design: 25 % complete	
Proponent: MassDOT Highway Division			
Street: 10 Park Plaza, Suite 4260			
Municipality: Boston		State: MA	Zip Code: 02116
Name of Contact Person From Whom Copies of this ENF May Be Obtained: Michael Trepanier			
Firm/Agency: MassDOT Highway Division		Street: 10 Park Plaza, Suite 4260	
Municipality: Boston		State: MA	Zip Code: 02116
Phone: 617-973-8250	Fax: 617-973-8879	E-mail: michael.trepanier@state.ma.us	

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
☐ Yes ☒ No

Has this project been filed with MEPA before?
☐ Yes (EOEA No._____) ☒ No

Has any project on this site been filed with MEPA before?
☐ Yes (EOEA No._____) ☒ No

Is this an Expanded ENF (see 301 CMR 11.05(7)) requesting:

a Single EIR? (see 301 CMR 11.06(8))	☐ Yes	☒ No
a Special Review Procedure? (see 301CMR 11.09)	☐ Yes	☒ No
a Waiver of mandatory EIR? (see 301 CMR 11.11)	☐ Yes	☒ No
a Phase I Waiver? (see 301 CMR 11.11)	☐ Yes	☒ No

Identify any financial assistance or land transfer from an agency of the Commonwealth, including the agency name and the amount of funding or land area (in acres): The project involves a Massachusetts Department of Transportation (MassDOT)-owned bridge and Department of Conservation and Recreation (DCR)-owned land. The estimated project cost is $24.5 million. MassDOT is funding the project through the Accelerated Bridge Program.

Are you requesting coordinated review with any other federal, state, regional, or local agency?
☐Yes(Specify_____) ☒No

List Local or Federal Permits and Approvals: Orders of Conditions from the Boston and Cambridge Conservation Commissions

Which ENF or EIR review threshold(s) does the project meet or exceed (see 301 CMR 11.03):

☐ Land
☐ Water
☐ Energy
☐ ACEC
☐ Rare Species
☐ Wastewater
☐ Air
☐ Regulations
☒ Wetlands, Waterways, & Tidelands
☒ Transportation
☐ Solid & Hazardous Waste
☐ Historical & Archaeological Resources

Summary of Project Size & Environmental Impacts	Existing	Change	Total
LAND			
Total site acreage	3.54 acres		
New acres of land altered		0	
Acres of impervious area	2.06 acres	0.01 acres	2.07 acres
Square feet of new bordering vegetated wetlands alteration		0	
Square feet of new other wetland alteration		22,767 SF RFA 7,328 SF BLSF 823 SF LUW 239 LF Bank	
Acres of new non-water dependent use of tidelands or waterways		0	
STRUCTURES			
Gross square footage (bridge)	8,322 SF	0	8,322 SF
Number of housing units	n/a	n/a	n/a
Maximum height (in feet)	20.8 FT	0	20.8 FT
TRANSPORTATION			
Vehicle trips per day	21,300	0	21,300
Parking spaces	0	0	0
WATER/WASTEWATER			
Gallons/day (GPD) of water use	n/a	n/a	n/a
GPD water withdrawal	n/a	n/a	n/a
GPD wastewater generation/ treatment	n/a	n/a	n/a
Length of water/sewer mains (in miles)	n/a	n/a	n/a

State Permits & Approvals

☒ Order of Conditions
☐ Superseding Order of Conditions
☐ Chapter 91 License
☐ 401 Water Quality Certification
☐ MHD or MDC Access Permit
☐ Water Management Act Permit
☐ New Source Approval
☐ DEP or MWRA Sewer Connection/ Extension Permit
☒ Other Permits (*including Legislative Approvals*) – Specify:

State Historic (Chapter 254) Review

MWRA 8(m) Permit

CONSERVATION LAND: Will the project involve the conversion of public parkland or other Article 97 public natural resources to any purpose not in accordance with Article 97?

☐Yes (Specify) ☒No

The Charles River Reservation, owned and operated by the DCR, borders the Anderson Memorial Bridge on all four quadrants. The structural repairs to the wingwalls and stairway, as well as potential construction of stormwater treatments, will require temporary use of the DCR property during construction. It is also proposed that the northwest quadrant of DCR property be used for construction staging. Pedestrian and bicycle access through the parkland will be maintained during construction. Landscaping disturbed by the project will be carefully restored to be consistent with DCR's *Charles River Basin Master Plan*. Parkland is not being converted to transportation use. All aspects of the project design and construction, as they relate to the DCR parkland, will be closely coordinated with DCR. It is anticipated that modifications to DCR resources will not result in a permanent conversion of public parkland and that the parkland uses are consistent with the purposes of Article 97.

Will it involve the release of any conservation restriction, preservation restriction, agricultural preservation restriction, or watershed preservation restriction?

☐Yes (Specify) ☒No

The post-construction landscape restoration proposed on DCR property is consistent with the function of the existing parkland and intended to enhance the resource. DCR will review and approve the plans for temporary construction activities and post-construction park enhancements on parkland under their jurisdiction. No parkland will be released from conservation.

RARE SPECIES: Does the project site include Estimated Habitat of Rare Species, Vernal Pools, Priority Sites of Rare Species, or Exemplary Natural Communities?

☐Yes (Specify) ☒No

The project is an urban area of riverfront parklands and arterial roads. There are no Estimated Habitats of Rare Species, Vernal Pools, Priority Sites of Rare Species, or Exemplary Natural Communities according to the *13th Edition Massachusetts Natural Heritage Atlas* data layer (2008).

HISTORICAL /ARCHAEOLOGICAL RESOURCES: Does the project site include any structure, site or district listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth?

☒Yes (Specify) ☐No

The Anderson Memorial Bridge, surface road approaches, and surrounding parklands are contributing resources to the Charles River Basin Historic District listed in the State Register of Historic Places. The bridge and the district are each listed in the Inventory of Historic and Archaeological Assets of the Commonwealth. The bridge is also individually National Register-eligible and a contributing element to the National Register-listed Charles River Basin Historic District. For the purposes of this MEPA filing, we will refer to the bridge and District as a National/State Register-listed property.

One inventoried pre-contact archaeological site is within the project area. The site is identified as 19-MD-173 in the Commonwealth's Inventory of Archaeological Assets. The Inventory form for this site indicates that the site has been destroyed, but MassDOT will complete a reconnaissance survey of the area to make sure that there is no potential disturbance to any unknown archeological sites within the project area.

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources?

☐Yes (Specify) ☒ No

The rehabilitation of the bridge includes the repair/replacement of the spandrel walls and parapets, repair/reinforcement of concrete arches, miscellaneous repairs to other elements of the bridge structure, and repair/replacement of the brick walls and bridge lighting system. Repairs and replacement of bridge elements will be completed in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties* and in coordination with Massachusetts Historical Commission to ensure protection of historic resources.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN: Is the project in or adjacent to an Area of Critical Environmental Concern?

☐Yes (Specify) ☒No

There are no Areas of Critical Environmental Concern within the project limits, according to the MassGIS Areas of Critical Environmental Concern datalayer (2009).

PROJECT DESCRIPTION: The project description should include **(a)** a description of the project site, **(b)** a description of both on-site and off-site alternatives and the impacts associated with each alternative, and **(c)** potential on-site and off-site mitigation measures for each alternative (*You may attach one additional page, if necessary*.)

A. Project site:

Background

The Anderson Memorial Bridge was constructed in 1915 over the Charles River, connecting Boston and Cambridge, Massachusetts. The bridge was built as a memorial to Nicolas Longworth Anderson, a Major General in the Civil War, by his son Larz Anderson. It stands on the site of the "Great Bridge" built in 1662, which was the first structure to span the Charles River. The Anderson Memorial Bridge is listed on the State and National Register of Historic Places as a historic structure within the Charles River Basin Historic District.

The Anderson Memorial Bridge is considered a strategic link between Cambridge and Boston's Allston neighborhood and connects the Harvard University campuses. The bridge has four lanes of two-way traffic with a sidewalk on each side and is heavily used by vehicles, bicyclists and pedestrians as a main thoroughfare. The bridge carries North Harvard Street over the Charles River from Boston to an at-grade intersection with Memorial Drive in Cambridge. On the Boston-side, there is an interchange allowing traffic to circulate to and from Soldiers Field Road. Approximately 21,300 vehicles cross the bridge daily, of which only 6 percent is truck traffic. There are two MBTA bus routes (#66 and #86) that use this bridge to provide service to over 15,000 passengers daily. Additionally, the Harvard University shuttle uses the bridge to provide service between campuses.

The Anderson Memorial Bridge is proposed for rehabilitation as a result of its structurally deficient state. There is a significant amount of cracking and spalling in the concrete and brick features, some bricks are loose or missing, and the waterproofing membrane has been compromised impacting the structural integrity of the arches. The spandrel walls, parapet, stairway, brick arch-ring and wing walls are severely deteriorated and require replacement. The deterioration of the brick arch rings resulted in the installation of protective netting in 2009 by DCR to prevent bricks falling into the river and potentially harming boaters. The concrete arches are in a fair condition, but require significant rehabilitation.

Project Area

The proposed project area is located along and proximate to North Harvard Street and JFK Street in Boston and Cambridge, Massachusetts. The project involves rehabilitating the Anderson Memorial Bridge, roadway and sidewalk reconstruction, lighting and utility upgrades, and landscape restoration proximate to the project location. The project limits extend along North Harvard Street from about 300 feet southwest of the Anderson Memorial Bridge, including the intersection of Soldiers Field Road, to about 500 feet northeast of the bridge along JFK Street, including the intersection of Memorial Drive, a distance of approximately 1,100 feet. The Anderson Memorial Bridge is under the jurisdiction of MassDOT while the project intersections and adjacent land are under the jurisdiction of the DCR.

The Anderson Memorial Bridge is a three-span arch bridge carrying North Harvard Street over the Charles River to connect Boston and Cambridge. The bridge is comprised of earth filled reinforced concrete arches supported on concrete abutments and piers. The length of the bridge is 440 feet including approaches between abutments; the overall out to out width of the bridge is 64 feet.
The south side of the bridge is within the City of Boston. It is comprised of the on and off ramps at Soldiers Field Road approaching from the east and west and North Harvard Street running in a north-south direction. South of the ramps, North Harvard Street has one 10-foot lane traveling southbound and two 10-foot lanes traveling northbound along with 5-foot wide bike lanes on each side for a total roadway width of 40 feet. Sidewalks are located on both sides of North Harvard Street. At the intersection, the eastbound off-ramp has an exclusive left-turn lane and a shared through/right-turn lane. The westbound off-ramp has a shared left-turn/through lane and a channelized right-turn lane. North of the ramps, North Harvard Street has two lanes traveling in each direction with a curb-to-curb roadway width of 40 feet.

The north side of the bridge is within the City of Cambridge. It consists of JFK Street approaching from the north, North Harvard Street approaching from the south and Memorial Drive approaching from the east and west. Both JFK Street and Memorial Drive have two lanes in each direction. Left-turns are restricted from Memorial Drive in the morning (7-9 AM) and evening peak hours (4-7 PM). South of Memorial Drive, North Harvard Street has a curb-to-curb width of 40 feet, with 18-foot wide sidewalks on both sides near the intersection. These sidewalks narrow to a 10-foot width over the bridge.

B. Project Description/Alternatives:

MassDOT is undertaking the repair and rehabilitation of the Anderson Memorial Bridge as part of the Commonwealth's Accelerated Bridge Program (ABP). Originally the funds allotted from the ABP were divided between the former Massachusetts Highway Department and the bridges and highway section of the DCR. Now all ABP funds and associated projects are managed and overseen by MassDOT. The Anderson Memorial Bridge project was transferred from DCR as part of the MassDOT integration on November 1, 2009.

The Anderson Memorial Bridge is structurally deficient and deteriorating. The purpose of this project is to repair the structure of the Anderson Memorial Bridge to meet the current and future multi-modal transportation needs and extend the life of the bridge.

<u>Proposed Work</u>
MassDOT selected a consultant team led by Fay, Spofford & Thorndike, LLC to provide a preliminary design for the rehabilitation of the Anderson Memorial Bridge. This design involves structural repairs to the existing three-span concrete arch. Work includes repairs and rehabilitation of the brick masonry components throughout the structure, parapets, spandrel walls over the piers and abutments, wing-walls, concrete arches and deck, and stairway. The project also includes at-grade intersection improvements, lighting and utility upgrades on the bridge superstructure and landscape restoration adjacent to the bridge.

The rehabilitation project provides an opportunity to improve the multi-modal transportation safety and functions of the Anderson Bridge. The vehicular, pedestrian and bicycle usage has been thoroughly studied in this area. The traffic analysis considered for the design was based on future traffic volumes (projections to 2028) and included pedestrian crossings, bicycle accommodations, and peak/off-peak periods. The proposed design reduces the number of travel lanes on the bridge from four lanes to three in order to provide the space for the addition of bike lanes in each direction. With this reduction in the number of travel lanes, at-grade improvements to the intersections immediately north and south of the bridge are being proposed; the improvements include geometric, signal timing and phasing changes.

All repairs, modifications and improvements will be consistent with the historic character of the bridge and Charles River Basin Historic District and with the DCR's *Charles River Basin Master Plan*. Project construction will be staged to minimize impacts and maintain pedestrian and vehicular traffic.

Construction Approach

Staged construction is planned for the project and shown on plans provided in Attachment 2. Temporary Traffic Control Plans have been developed for each phase of construction and consists of the placement of concrete barriers, construction fencing, signs, pavement markings and changeable message signs. The proposed Temporary Traffic Control Plans are designed to keep one travel lane open in each direction to vehicular traffic and one sidewalk open to pedestrians during construction. For proposed construction operations on the concrete archways from below the bridge, two of the three arches are to remain open at all times. A lighted construction barge will be anchored within the closed arch.

Prior to setting up the proposed construction staging area on the northwest quadrant of the bridge in Cambridge, the Contractor will construct a 10' wide temporary asphalt path from the existing trail along the river to the existing asphalt path along Memorial Drive. The proposed Temporary Traffic Control Plans are illustrated in Attachment 9.

Landscaping Approach

The landscaping goals for this project are to protect existing resources during construction where possible and to restore the areas damaged through construction and staging activities. Restoration of the landscape in this case does not refer to restoring the landscape to a particular historical condition; however it will involve restoring areas damaged through construction to a condition that is consistent with DCR's *Master Plan for the Charles River Basin*. Landscaping activities will include the planting of new deciduous shade trees to replace trees that need to be removed in order to rehabilitate the bridge, aeration of the soil that was compacted during construction, removal of invasive, non-native species, replacement/widening of paths damaged during construction, and replacement or restoration of site furnishings and lighting. Additional visual improvements include lighting on the bridge that is consistent with the historic character of the bridge.

The development of the landscape plans for the Anderson Memorial Bridge Rehabilitation have additionally taken into consideration a number of planning documents including those from MassDOT and DCR. For details on the landscaping plans, see Landscaping Plans Sheets L1-6 in Attachment 2 and Tree Removal Tables in Attachment 7.

Restoration of the Character of the Landscape

The character of the landscape design was based upon Massachusetts Highway Department's *Project Development and Design Guide*, Chapter 13 – Landscape and Aesthetics, 2006 Edition. This chapter has objectives of:

> "(1) restoration and rehabilitation of natural and cultural resources, (2) restoration and rehabilitation of landscapes damaged or compromised by transportation improvements, and (3) enhancement of the corridor such that it becomes not merely a functional facility, but a community asset." (p. 13-1).

Specific guidelines include: "plant material should be selected and located to enhance the architectural lines of the bridge, rather than to screen bridge" (p. 13-24), removal of existing plants that are invasive, structurally unsound or show signs of decay, and impacted by construction (p. 13-41), new planting was selected using list of Suggested Street Trees (p.13-31), and steep slope on Boston side designed per "13.4.3.1 Cultivating Grasses and Wildflower Meadows" (p.13-34)."

Also utilizing DCR's *Historic Parkway Preservation Treatment Guidelines* (March 2007), invasive species, small ornamental trees and 'volunteer' trees at bridge abutments and armor stone and riprap at river bank are shown to be removed. The character of the proposed landscape was designed according to these DCR criteria:

> "Goal: *Preserve and restore positive vistas from the travel way and mitigate negative ones.*
>
> Issues for Vista from the Travelway.
> The viewshed, where scenic, is a fundamental character-defining feature. Roadside trees

often frame special vistas. Over time, designed views of features inside the parkway decline due to poor maintenance….or growth of invasive vegetation. ….Overgrown vegetation hides vistas to fields, riverbanks…."

DCR's Historic Parkway Guidelines also indicates in 3.3.9:

"Vegetation, Goal: Preserve, protect and restore parkway vegetation according to original design intent.

Issues for Vegetation - Some planting of inappropriate ornamental small trees has occurred where the historic character calls for large shade trees."

Selection of Appropriate Plant Species

DCR's *Charles River Basin Master Plan*, Appendix E indicates appropriate plant species for use along the Charles River. Specific trees were selected utilizing this list, with an emphasis on large shade trees to conform to their Historic Parkway Guidelines, native or native appearing species, low-maintenance and disease resistant species and also cross-referencing with trees that are primarily resistant to Asian Long-horned Beetle infestation, per USDA, which is a recent and growing concern in the northeast.

Selection and Layout of Paths

Existing deteriorated paths west of the bridge on the Cambridge side will likely be further deteriorated by construction staging and activities, so replacement and improved layout and materials were considered in the proposed landscape design for the bridge. Sidewalks and paths on other quadrants of the bridge are maintained in their present condition, except where engineering plans revised the sidewalk paving and improve the pedestrian curb ramps at the intersections.

The bituminous concrete multi-use pathway extending westward parallel to Memorial Drive on the Cambridge side of the bridge was widened from 6 feet to 10 feet to accommodate extensive use by bicycles and pedestrians. An additional 6 foot runners' path of stabilized aggregate was placed several feet south of the multiuse path. While these paths both merge back to the existing narrow multi-use path at the limit of the project area, this initiates a path layout that DCR plans to continue in the future. The existing path to the river from the JFK Street intersection of Memorial Drive on the Cambridge west quadrant will be widened from 6 feet to 10 feet and will be paved with stabilized aggregate. The path will make an arc to then parallel the river edge. Side paths, also of stabilized aggregate, continuing to the stairs at the bridge will be 6 feet wide.

Selection and Layout of Site Furnishings

Existing historic Shurcliff designed benches (DCR standard) are sound but need to be removed for construction staging and operations. They will have their finishes restored and will be reset on a concrete pad with a granite edge in keeping with recent work done at the Memorial Drive Embankment.

The existing dilapidated bicycle rack, presently located in the middle of a major viewshed to the river from the JFK/Memorial Drive intersection, will be disposed of. It will be replaced with a series of cast metal bicycle rings mounted on steel posts on a concrete pad. They are to be installed near the bottom of the bridge stairs, peripheral to the main viewshed, but still convenient to users. Trash receptacles, proposed at three locations on the Cambridge west quadrant, are the DCR standard barrel, painted green, with their logo.

Bridge Rehabilitation Alternatives

A number of design alternatives were evaluated with the following considerations: MassDOT and Americans with Disabilities Act (ADA) design standards; maintenance of the integrity of the historic bridge, historic district, and natural resources; and spatial constraints imposed by adjacent Memorial Drive, Soldiers Field Road, and Charles River Reservation parkland. Alternative 1, rehabilitation of Anderson Memorial Bridge, has been selected as the preferred alternative.

The No Build Alternative was considered, but due to public safety concerns caused by the deteriorating

condition of the bridge and the fact that without rehabilitation MassDOT's ability to sustain transportation service would be significantly limited in the coming years, it was determined that a thorough rehabilitation project be pursued.

Complete replacement of the existing Bridge was considered as an alternative to rehabilitation during the earliest stages of project development, but was deemed undesirable because components of the current bridge structure are sound and replacement would not protect the National/State Register-listed Charles River Basin Historic District resource. Additionally, full replacement would require additional costs, permitting, and difficulty in maintaining conveyance of all modes of travel during construction.

The three alternatives that were considered most appropriate for further consideration and discussion are presented in Attachment 5 *Bridge Rehabilitation Recommendation Memorandum* and are summarized as follows:

Alternative 1/Rehabilitation the Existing Concrete Arches: Involves structural repairs to the existing three-span concrete arches, removal and replacement of the spandrel walls, masonry sidewalk parapets and cap stones, sidewalk, access stairway, approach wing walls, roadway surface and gravel fill. Significant concrete repair to the existing arches is required to achieve an estimated structure life of 40 to 50 years. This option was selected because it has comparatively fewer and less severe temporary impacts, provides the lowest estimated project cost and duration, and minimal historic and environmental compliance issues. *(Estimated cost $22 million and duration of 38 months)*

Alternative 2/ New Concrete Arches: Involves the complete superstructure replacement of the bridge. New arches would provide an estimated structure life of 75 years; however moderate modifications to the piers and abutments would also be required. This option has the highest estimated project cost and longest duration, and considerable temporary impacts. *(Estimated cost $34 million and duration of 50 months)*

Alternative 3/New Box Beam Superstructure over Existing Arches: Involves the use of pre-cast concrete box beams for the installation of a three span simply supported bridge over all three arch spans which would be founded on a retrofitted steel-concrete pile foundation cored through the existing cyclopean piers. The existing granular fill material between the new beams and the lower existing arch spans would be permanently removed including the existing spandrel walls. The existing concrete arches, concrete piers and timber pile foundation would be retained. The project cost and duration would be greater than Alternative 1 and less than Alternative 2, achieving an estimated structure life of 40 to 50 years using existing arches and 75 years with a new superstructure. This option has significant service life, but with major maintenance, roadway, and historic issues. *(Estimated cost $26 million and duration of 42 months)*

Please note that the costs for each alternative have significantly inflated due to rising costs of materials and labor, however they have remained relative to each other.

<u>Bicycle and Pedestrian Accommodations</u>
MassDOT approached the bridge rehabilitation project as an opportunity to improve pedestrian and bicycle connections around the bridge.

Enhanced at-grade improvements at the intersections immediately north and south of the bridge are proposed to improve bicycle and pedestrian safety and accessibility. The at-grade improvements include:

- Dedicated north and south bike lanes added on the Anderson Bridge.
- Upgraded signal timing and phasing, to include concurrent phasing and leading pedestrian interval and interconnected/coordinated traffic signals at Memorial Drive and Soldier's Field Road.
- Elimination of raised delta islands and smaller turning radii at Soldiers Field Road.
- Striped bike lanes on the bridge approach roadways.
- Relocated pedestrian signal.
- Prohibited left turns at Memorial Drive/JFK Street.

MassDOT is coordinating these recommendations with DCR because the project intersections and adjacent land are under their jurisdiction.

Bicycle and Pedestrian Alternatives

A thorough evaluation of options available to improve bicycle and pedestrian use at the intersections adjacent to the bridge has been performed. It was determined that significant at-grade intersection improvements (as described above) are practical options, however MassDOT additionally conducted a feasibility study for the construction of a bicycle and pedestrian underpass through the existing bridge approach walls. The *Bike and Pedestrian Underpass Feasibility Study* is included as Attachment 6 to the ENF.

The selected scope for rehabilitating the Anderson Memorial Bridge (Alternative 1 – Rehabilitating the Existing Arches) was used as the baseline for assessing cost and schedule impacts associated with construction of the underpass. The study identified various prohibitive aspects related to the construction of the underpasses, including a finding of an undesirable Adverse Effect to the National/State Register-listed Charles River Basin Historic District by the Massachusetts Historic Commission (MHC Correspondence in Attachment 6, Appendix D) and anticipated increased cost and schedule delays. An Adverse Effect is avoidable through the selection of an alternative that allows for the preservation of the historic integrity of this significant cultural resource. The Preferred Alternative (Alternative 1, above) avoids an Adverse Effect, significantly improves the safety of bicycle and pedestrian users, and is consistent with MassDOT's principals of Context Sensitive Design, therefore, construction of the underpasses has been dismissed.

In total, seven alternatives were explored as summarized below.

Alternative 1A: This alternative includes the construction of a concrete underpass through the Cambridge approach walls, located approximately ten feet behind the bridge abutment to facilitate the rerouting of existing water mains on the bridge. This alternative would require the reconfiguration or elimination of the existing stairway located at the northwest approach wall and would have an adverse effect on the historical integrity of the bridge and the National/State Register-listed Charles River Basin Historic District.

Alternative 1B: This alternative includes the construction of a concrete underpass through the Cambridge approach walls, located approximately four feet behind the bridge abutment and beneath the existing water mains. This alternative would impact the stairway located at the northwest approach and would have an adverse effect on the historical integrity of the bridge and the National/State Register-listed Charles River Basin Historic District.

Alternative 2: This alternative includes the construction of a timber boardwalk structure on the Cambridge side, in lieu of an underpass, which would extend into the Charles River and beneath the northern-most arch. This alternative will have an adverse impact on the hydraulic opening, boat navigation, and rowing usage through the channel of the river. Furthermore, construction of the approach to the boardwalk would likely have an adverse effect on the historical integrity of the National/State Register-listed Charles River Basin Historic District.

Alternative 3A: This alternative includes the construction of a concrete underpass through the Boston approach walls, located approximately 10 feet behind the bridge abutment to facilitate the rerouting of the existing water mains. The profile will require construction of wingwalls and retaining walls outside the limits of the bridge and would have an adverse effect on the historical integrity of the bridge and the National/State Register-listed Charles River Basin Historic District.

Alternative 3B: This alternative includes the construction of a concrete underpass through the Boston approach walls, located approximately four feet behind the bridge abutment and beneath the existing water mains. This alternative will require construction of wingwalls and retaining walls outside the limits of the bridge and would have an adverse effect on the historical integrity of the bridge and the National/State Register-listed Charles River Basin Historic District.

Alternative 4: This alternative includes the construction of a timber boardwalk structure in lieu of an underpass on the Boston side, which would extend into the Charles River and through the southern-most arch. This alternative will have an adverse impact on the hydraulic opening, boat navigation, and rowing usage through the channel of the river. Furthermore, this will require construction of retaining walls outside the limits of the bridge, which would likely have an adverse effect on the historical integrity of the National/State Register-listed Charles River Basin Historic District.

It was concluded that the at-grade intersection improvements will achieve the goals of improving safety for pathway users with significantly less negative impact to the adjacent parkland, the Charles River and the historic nature of the bridge and its context; for these reasons, they are preferred over the underpass alternative.

Public Involvement

In 2009 MassDOT initiated an extensive community involvement process with the residential, commercial and institutional abutters and recreational users of the river and parkland such as boaters and rowers, to provide project updates and gather input. Copies of the early coordination letters are in Attachment 8.

An early coordination meeting with Harvard University officials occurred on December 8, 2009. An early coordination meeting with local boards, commissions and officials from Boston and Cambridge occurred on December 10, 2009. The public involvement process was formally initiated by a public meeting in the City of Cambridge on December 10, 2009. As the project design phase progressed, two additional informational meetings, MassDOT Design Public Hearings, were held on November 3, 2010 in the City of Cambridge and November 16, 2010 in the Allston neighborhood of the City of Boston during evening hours for the general public. A copy of the Design Public Hearing Presentation is in Attachment 9.

Public participation will continue throughout the MEPA and subsequent state permitting processes. Arrangements will be made to receive, investigate and respond to any suggestions to improve performance or address complaints during construction. Press releases, project updates, presentations, summaries from public meetings, and other project documents will be made available to the public on MassDOT's Accelerated Bridge Program website at http://www.massdot.state.ma.us/charlesriverbridges/
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C. Mitigation Measures: A number of measures will be implemented to offset impacts associated with the project and include construction period and long-term mitigation.

Construction Schedule and Coordination with Other Charles River Basin Bridge Projects

MassDOT is sequencing the timelines for all projects within the Charles River Basin using a basin-wide travel demand model in an effort to develop options that minimize traffic impact and preserve safe operations for all modes of transportation. In addition MassDOT has committed to working in coordination with the surrounding cities, state agencies, and private projects to address local concerns.

Construction Period Mitigation

Traffic and Pedestrian/Bicycle Mitigation: Traffic mitigation and pedestrian/bicycle access mitigation measures include: 1) a significant outreach program to alert the general public of potential delays in the vicinity and 2) staging to keep one travel lane open in each direction to vehicular traffic and one sidewalk open to pedestrians during construction.

Maintaining Access to Pathways Adjacent Parkland During Construction: Prior to setting up the proposed construction staging area on the northwest quadrant of the bridge in Cambridge, a ten foot wide temporary asphalt path from the existing trail along the river to the existing asphalt path along Memorial Drive will be constructed.

Boater Traffic Mitigation during Construction: Construction staging for the work in the river is required to rehabilitate the arches. The construction will be sequenced to minimize the impact to boater traffic. The work will be limited such that only one arch barrel at a time is closed for concrete repairs. The duration of any temporary vertical clearance reductions will be minimized. Safety measures for boaters will

include advanced notification to users and warning buoys. MassDOT will coordinate with the local Harbor Masters and U.S. Coast Guard.

Environmental Mitigation: Environmental mitigation measures include an erosion control system to avoid impacts on the Charles River and tarps and netting to assure that debris is not released into the river from work over water. Air quality and noise mitigation measures will be undertaken to minimize impacts associated with construction equipment emissions, dust, and noise.

Landscape Mitigation: Landscape mitigation includes strictly enforced construction limits and tree protection measures to minimize impacts to landscape features in the vicinity of the project.

Long-term Mitigation

Traffic, Pedestrian and Bicycle Mitigation: The proposed reduction of a vehicle travel lane on the bridge and the addition of two bike lanes in concert with enhanced at-grade intersection improvements should improve the overall traffic, pedestrian and bicycle safety and flow in the vicinity.

Environmental Mitigation: Long-term environmental mitigation measures include stabilization of all disturbed soil impacted from the construction. Wetland resource area mitigation includes landscape restoration, slope stabilization and removal of invasive trees within the Bordering Land Subject to Flooding (BLSF) and Riverfront Area resources. Removal and resetting of the existing rip rap stone along the riverbank will occur as part of the work on the abutments and wingwalls and invasive tree removal. Stormwater mitigation for the project will be consistent with MassDOT's Impaired Waterbody Program and comply with MADEP's Stormwater Management Policy and EPA's NPDES MS4 general permit. The location and selection of stormwater BMPs are being evaluated to improve water quality and minimize impacts of stormwater runoff to the Charles River to the greatest extent practicable.

Landscape Mitigation: The impacts to the landscaping of the adjacent parklands will occur as a result of the proposed construction to the abutments and wingwalls and the construction staging area. These unavoidable impacts present an opportunity to restore the landscaping in a manner to be consistent with the goals of the *Charles River Basin Master Plan*. Landscaping mitigation will include the planting of new deciduous shade trees to replace trees that need to be removed in order to rehabilitate the bridge, aeration of the soil that was compacted during construction, and replacement of paths damaged during construction. Additional visual improvements include lighting on the bridge that is consistent with the historic character of the bridge.

LAND SECTION – all proponents must fill out this section

I. Thresholds / Permits

A. Does the project meet or exceed any review thresholds related to **land** (see 301 CMR 11.03(1)
__ Yes _X__ No; if yes, specify each threshold:

II. Impacts and Permits

A. Describe, in acres, the current and proposed character of the project site, as follows:

	Existing	Change	Total
Footprint of buildings	none	none	none
Roadways, parking, and other paved areas	2.06 acres	+0.01 acres	2.07 acres
Other altered areas	1.48 acres	0 acres	1.48 acres
Undeveloped areas	none	none	none

The majority of the project work is associated with the bridge and its approaches and roadways which will remain paved. The proposed widening of pathways is reflected as the slight increase to other paved areas. Landscaping and slope/bank stabilization activities will occur in areas that have historically been altered and result in no net change.

B. Has any part of the project site been in active agricultural use in the last three years?

___ Yes _X__ No; if yes, how many acres of land in agricultural use (with agricultural soils) will be converted to nonagricultural use?
The project area is an urban area of riverfront parklands and arterial roads. There are no agricultural uses in the project area and there have not been any for at least the past three years.

C. Is any part of the project site currently or proposed to be in active forestry use?
___ Yes _X__ No; if yes, please describe current and proposed forestry activities and indicate whether any part of the site is the subject of a DEM-approved forest management plan:

The project area is an urban area of riverfront parklands and arterial roads. There are some urban shade trees in areas at both the Boston and Cambridge ends of the bridge. There are no forestry uses in the project area and none are planned.

D. Does any part of the project involve conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97? ___ Yes X__ No; if yes, describe:

Areas of public parkland, the Charles River Reservation, border the Anderson Memorial Bridge on all four quadrants. The structural repairs to the wingwalls and stairway will require temporary use of the DCR property during construction. It is also proposed that the northwest quadrant of DCR property be used for construction staging. Pedestrian and bicycle access through the parkland will be maintained during construction. Landscaping disturbed by the project will be carefully restored to be consistent with DCR's *Charles River Basin Master Plan*. The landscape restoration proposed on DCR property is consistent with the function of the existing parkland and intended to enhance the resource and does not require an Article 97 legislative approval. The parkland is not being permanently incorporated into the transportation facility.

E. Is any part of the project site currently subject to a conservation restriction, preservation restriction, agricultural preservation restriction or watershed preservation restriction? _ Yes _X_ No; if yes, does the project involve the release or modification of such restriction? ___ Yes _X__ No; if yes, describe:

F. Does the project require approval of a new urban redevelopment project or a fundamental change in an existing urban redevelopment project under M.G.L.c.121A? ___ Yes _X__ No; if yes, describe:

G. Does the project require approval of a new urban renewal plan or a major modification of an existing urban renewal plan under M.G.L.c.121B? Yes ___ No _X__ ; if yes, describe:

H. Describe the project's stormwater impacts and, if applicable, measures that the project will take to comply with the standards found in MADEP's Stormwater Management Policy:

The existing stormwater management facilities located within the project limits are comprised of a closed drainage system consisting of catch basins, manholes, piping, pump station and outfalls which discharge to the Charles River. The City of Boston closed drainage system collects stormwater runoff from Anderson Memorial Bridge, Soldiers Field Road and North Harvard Street prior to discharging to the Charles River. The City of Cambridge closed drainage system presently collects stormwater runoff from Anderson Memorial Bridge, JFK Street and Memorial Drive. No new stormwater outfalls will be created as part of the project. Existing storm drainage outfalls will be retained and utilized as part of the stormwater management system.

The project is considered a "Redevelopment of a previously developed site" under MADEP's Stormwater Management Policy. Under this policy, redevelopment projects must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.

The project is located within the Charles River Watershed and discharges stormwater to an MS4 system that discharges to the Charles River, an impaired waterway. The Watershed has two final TMDLs: Nutrients in the Lower Charles River (Phosphorus) and Pathogens.
The project will be consistent with MassDOT's Impaired Waterbody Program and comply with MADEP's Stormwater Management Policy and EPA's NPDES MS4 general permit. The location and selection of stormwater BMPs are being evaluated to improve water quality and minimize impacts of stormwater runoff to the Charles River to the greatest extent practicable.

The selected stormwater best management practices (BMPs) will control runoff, provide groundwater recharge and retain contaminants. Proposed BMPs include, where applicable, retrofitting of the existing closed drainage system by relocating or providing new deep sump/hooded catch basins, piping, deep sump drainage manholes and subsurface infiltration structures. It should be noted that conditions affecting the selection of stormwater BMPs include physical features such as drainage area, soil texture, groundwater, bedrock, land area and topography. Other items of consideration include impacts to existing parkland uses, aesthetics, setback requirements, maintenance and permitting requirements.

The project improvements will result in a slight increase in impervious area. Note that the annual groundwater recharge from the project area will approximate the annual recharge from existing conditions with the implementation of several infiltration BMPs. These subsurface infiltration structures are designed to provide the required groundwater recharge volume.

With respect to Total Suspended Solids (TSS), the proposed stormwater system is designed to remove 80% of the average annual post construction load of TSS. In regards to water quality, the required treatment volume provided is based upon 0.5 inches times the total impervious area of the post development project site. The proposed subsurface infiltration structures were ultimately sized to treat stormwater flows from the impervious areas, provide the required water quality volume and provided additional treatment of the final TMDLs (i.e. phosphorus and pathogens) associated with the Charles River.

I. Is the project site currently being regulated under M.G.L.c.21E or the Massachusetts Contingency Plan? Yes ___ No _X__ ; if yes, what is the Release Tracking Number (RTN)?

There are no known instances of hazardous waste and hazardous material releases within or adjacent to the project area. The MADEP Bureau of Waste Site Cleanup database and the EPA CERCLIS database were used to determine that there are no sites within or adjacent to the project site.

J. If the project site is within the Chicopee or Nashua watershed, is it within the Quabbin, Ware, or Wachusett subwatershed? ___ Yes _X_ No; if yes, is the project site subject to regulation under the Watershed Protection Act? ___ Yes _X_ No

K. Describe the project's other impacts on land:

Landscape treatments adjacent to the bridge abutments will prevent destructive woody vegetation impacts, provide erosion protection on the slopes, and improve access to the adjacent parkland.

III.. Consistency

A. Identify the current municipal comprehensive land use plan and the open space plan and describe the consistency of the project and its impacts with that plan(s):

The selected alternative is expected to improve universal accessibility, pedestrian, and bicycle access in the immediate area, which is consistent with the following plans:

The City of Boston Redevelopment Authority *2004 North Allston Strategic Planning Framework* includes goals to offer better transportation, open space and pedestrian connections to the River, and an open Harvard University campus.
In the City of Boston Zoning Districts: Allston/Brighton Neighborhood District Map 7B/7D 2010, the project location is within an open space district.
The *City of Cambridge Open Space and Recreation Plan 2009-2016* included in plan's goals are improvements to the quality of streets and sidewalks in the City, particularly for pedestrian and bicyclists; and to increase the use of park trails and multiuse pathways for pedestrian and bicycle use.

B. Identify the current Regional Policy Plan of the applicable Regional Planning Agency and describe the consistency of the project and its impacts with that plan:

The Metropolitan Area Planning Council's *MetroFuture 2008* is the regional plan for this area. The basic tenet of the plan is that growth is focused in areas where it already exists and linked by an efficient transportation system. Concentrated development encourages and enhances public transit use and pedestrian/bicycle access. The project is expected to improve universal accessibility, pedestrian, and bicycle access in the immediate area, which is consistent with *MetroFuture*.

The DCR *Master Plan for the Charles River Basin* provides a review, analysis, and recommendations for facilities along the entire length of the Charles River Basin. This project is consistent with the following general goals set forth by DCR in their Master Plan: (1) Preserve the essential character-defining features of the historic landscape while adapting the Basin for contemporary uses; (2) Enhance wildlife habitats while managing invasive species of plants and animals; (3) Establish a sustainable and maintainable landscape; (4) Provide safe and continuous bicycle, skating, and pedestrian access along the entire length of the Basin. Separate footpaths and bike paths where doing so will not create excessive pavement near the shoreline; and (5) Establish easier and safer pedestrian access across the parkways and bridges.

Goals of specific sections of the *Master Plan for the Charles River Basin* that intersect the project area are listed below:

In the Harvard Business School (6S) Section of the Master Plan, the existing conditions and issues on the Boston side of the Anderson Memorial Bridge are described as "the parkway embankment and open field between the Weeks Bridge and the Anderson Bridge is bare of vegetation and scoured by road sand." Two goals for this area are (1) to preserve the open, grassy character of the banks and views of the surrounding campus buildings and (2) reinforce the landscape character of the parkway.

In the Kennedy Park/Longfellow Park (7N) Section of the Master Plan, the existing conditions and issues on the Cambridge side of the Anderson Memorial Bridge are described as "trees along Memorial Drive are in decline" and "pedestrians find it difficult to cross Memorial Drive to get to the river between Anderson Bridge and the Eliot Bridge". The goals for this area are (1) to preserve the open character of the banks and the landscape character of the parkway, (2) create a comfortable and safe pathway along the river, and (3) provide a safe pedestrian access to the reservation.

The project is expected to meet these goals of the DCR's *Master Plan for the Charles River Basin*.

C. Will the project require any approvals under the local zoning by-law or ordinance (i.e. text or map amendment, special permit, or variance)? Yes ___ No _X__ ; if yes, describe:

D. Will the project require local site plan or project impact review?
___ Yes _X__ No; if yes, describe:

RARE SPECIES SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **rare species or habitat** (see 301 CMR 11.03(2))? ___ Yes _X__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **rare species or habitat**? ___ Yes _X_ No

C. If you answered "No" to both questions A and B, proceed to the **Wetlands, Waterways, and Tidelands Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Rare Species section below.

II. Impacts and Permits

A. Does the project site fall within Priority or Estimated Habitat in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes ___ No. If yes,

1. Which rare species are known to occur within the Priority or Estimated Habitat (contact: Environmental Review, Natural Heritage and Endangered Species Program, Route 135, Westborough, MA 01581, allowing 30 days for receipt of information):
2. Have you surveyed the site for rare species? ___ Yes ___ No; if yes, please include the results of your survey.
3. If your project is within Estimated Habitat, have you filed a Notice of Intent or received an Order of Conditions for this project? ___ Yes ___ No; if yes, did you send a copy of the Notice of Intent to the Natural Heritage and Endangered Species Program, in accordance with the Wetlands Protection Act regulations? ___ Yes ___ No

B. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ___ No; if yes, describe:

C. Will the project alter "significant habitat" as designated by the Massachusetts Division of Fisheries and Wildlife in accordance with M.G.L. c.131A (see also 321 CMR 10.30)? ___ Yes ___ No; if yes, describe:

D. Describe the project's other impacts on rare species including indirect impacts (for example, stormwater runoff into a wetland known to contain rare species or lighting impacts on rare moth habitat):

WETLANDS, WATERWAYS, AND TIDELANDS SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wetlands, waterways, and tidelands** (see 301 CMR 11.03(3))? _X_ Yes _____ No; if yes, specify, in quantitative terms:

The project involves greater than ½ acre impact to other wetlands (301 CMR 11.03(3)(b)1.f.). The impacts to other wetland areas are summarized below.

B. Does the project require any state permits (or a local Order of Conditions) related to **wetlands, waterways, or tidelands**? _X__ Yes ___ No; if yes, specify which permit:

Orders of Conditions from both the Boston and Cambridge Conservation Commissions.

C. If you answered "No" to both questions A and B, proceed to the **Water Supply Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wetlands, Waterways, and Tidelands Section below.

II. Wetlands Impacts and Permits

A. Describe any wetland resource areas currently existing on the project site and indicate them on the site plan:

Wetland resources at the project site are Land Under Water, Inland Bank, Riverfront Area, and Bordering Land Subject to Flooding. The Land Under Water is the land under the Charles River. The banks on all four quadrants of the bridge consist of rock rip rap. The northwest quadrant of the bank also includes a short section of a concrete retaining wall. Bordering Land Subject to Flooding is defined by reference to the FEMA flood insurance rate maps, and is delineated at elevation 4.0 NAVD88. The Riverfront Area on both sides of the Charles River has a width of 25 feet in this designated densely developed area.

B. Estimate the extent and type of impact that the project will have on wetland resources, and indicate whether the impacts are temporary or permanent:

Coastal Wetlands	Area (in square feet) or Length (in linear feet)
Land Under the Ocean	n/a
Designated Port Areas	n/a
Coastal Beaches	n/a
Coastal Dunes	n/a
Barrier Beaches	n/a
Coastal Banks	n/a
Rocky Intertidal Shores	n/a
Salt Marshes	n/a
Land Under Salt Ponds	n/a
Land Containing Shellfish	n/a
Fish Runs	n/a
Land Subject to Coastal Storm Flowage	n/a
Inland Wetlands	
Bank	239 linear feet of temporary impacts
Bordering Vegetated Wetlands	n/a
Land under Water	823 SF temporary impact
Isolated Land Subject to Flooding	n/a
Bordering Land Subject to Flooding	6,795 SF temporary impact; 533 SF permanent impact
Riverfront Area	21,811SF temporary impact; 956 SF permanent impact

Temporary disturbance of the Bank, Land Under Water, Bordering Land Subject to Flooding, and Riverfront Areas may occur as a result of removal and resetting of existing rip rap stone during (1) the removal of trees and (2) repairs to the bridge abutments and wing walls.

Minimal permanent impact to Riverfront Areas may occur due to: (1) the placement of slope stabilization material next to the wing walls and (2) widening of the existing walkway to improve accessibility to the riverfront area. Minimal permanent impact to the Bordering Land Subject to Flooding may occur due to the placement of slope stabilization material next to the wing walls. The volume of impacted flood storage will be negligible since the slope will remain relatively unchanged.

C. Is any part of the project

1. a limited project? _X_ Yes __ No 310 CMR 10.53(3)(f)
2. the construction or alteration of a dam? ___ Yes _X_ No; if yes, describe:
3. fill or structure in a velocity zone or regulatory floodway? ___ Yes _X_ No
4. dredging or disposal of dredged material? ___ Yes X__ No; if yes, describe the volume of dredged material and the proposed disposal site:
5. a discharge to Outstanding Resource Waters? ___ Yes _X_ No
6. subject to a wetlands restriction order? ___ Yes _X_ No; if yes, identify the area (in square feet):

D. Does the project require a new or amended Order of Conditions under the Wetlands Protection Act (M.G.L. c.131A)? _X_ Yes ___ No; if yes, has a Notice of Intent been filed or a local Order of Conditions issued? ___ Yes X__ No; if yes, list the date and DEP file number:_____.

Was the Order of Conditions appealed? ___ Yes ___ No. Will the project require a variance from the Wetlands regulations? ___ Yes ___ No.

E. Will the project:
1. be subject to a local wetlands ordinance or bylaw? ___ Yes _X_ No
2. alter any federally-protected wetlands not regulated under state or local law? ___ Yes _X_ No; if yes, what is the area (in s.f.)?

F. Describe the project's other impacts on wetlands (including new shading of wetland areas or removal of tree canopy from forested wetlands):

Shading: The project does not create any new shading impacts. The area of the bridge over the water will stay exactly the same and no vegetated wetlands will be impacted.

Loss of Canopy: A total of 16 trees will be removed on the Boston side of the bridge, and of those trees: one tree is in the Bank resource area (a volunteer species growing in the rip rap), one tree is in the Bordering Land Subject to Flooding, 10 trees are in the Riverfront Area, and four trees are outside the resource areas.

A total of 60 trees will be removed on the Cambridge side of the bridge, and of those trees: three trees are in the Bank resource area (volunteer species growing in the rip rap), five trees are in the Bordering Land Subject to Flooding, 10 trees are in the Riverfront Area, and 42 are outside the resource areas.

The landscaping plans are found in Sheets L1-6 in Attachment 2 and justification for tree removal is provided in Tree Removal Tables in Attachment 7.

III. Waterways and Tidelands Impacts and Permits

A. Is any part of the project site waterways or tidelands (including filled former tidelands) that are subject to the Waterways Act, M.G.L.c.91? _X_ Yes ___ No; if yes, is there a current Chapter 91 license or permit affecting the project site? ___ Yes _X_ No; if yes, list the date and number:

B. Does the project require a new or modified license under M.G.L.c.91? ___ Yes _X_ No; if yes, how many acres of the project site subject to M.G.L.c.91 will be for non-water dependent use?
Current ___ Change ___ Total ___

A historic bridge on this site was licensed (Harbors & Lands #1287), and it is anticipated no new license will be required. The bridge is currently a water dependent use as a transportation route across the waterway. The bridge will remain in existing transportation use and configuration. Intrusion in to the waterway will not change and the navigational clearances will not be altered.

Chapter 91 authorization is not considered to be required, as consultation with MassDEP's Wetlands and Waterways Section has determined that the Anderson Memorial Bridge is considered "a continuation of an existing, unauthorized public service project" under Activities Not Requiring a License or Permit (310 CMR Section 9.05 (3)(c)).

C. Is any part of the project
1. a roadway, bridge, or utility line to or on a barrier beach? __ Yes _X_ No; if yes, describe:
2. dredging or disposal of dredged material? ___ Yes _X__ No; if yes, volume of dredged material _____
3. a solid fill, pile-supported, or bottom-anchored structure in flowed tidelands or other waterways? _X__ Yes ___ No; if yes, what is the base area? _____

The existing piers and abutments are pile-supported. The proposed work will not occur

below the water.

4. within a Designated Port Area? ___ Yes _X__ No

D. Describe the project's other impacts on waterways and tidelands:

There are no permanent impacts on waterways and tidelands.

IV. Consistency:

A. Is the project located within the Coastal Zone? ___ Yes _X_ No; if yes, describe the project's consistency with policies of the Office of Coastal Zone Management:

The project area is not within the defined Coastal Zone as described in the “Boundary Appendix” to 301 CMR 21.00 “Coastal Zone Management Federal Consistency Review Regulations” and as shown in “Massachusetts Coastal Zone Plan”, Volume II, Chapter 5 “Coastal Regions and Atlas of Resources”, Executive Office of Environmental Affairs, 1977.

B. Is the project located within an area subject to a Municipal Harbor Plan? ___ Yes _X_ No; if yes, identify the Municipal Harbor Plan and describe the project's consistency with that plan:

The City of Boston has Municipal Harbor Plans that encompass several areas of the city. The boundaries of the Municipal Harbor Plan Areas do not include the Charles River Basin. The City of Cambridge does not have a Municipal Harbor Plan.

WATER SUPPLY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **water supply** (see 301 CMR 11.03(4))? ___ Yes _X_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **water supply**? ___ Yes _X_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Wastewater Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Water Supply Section below.

II. Impacts and Permits

A. Describe, in gallons/day, the volume and source of water use for existing and proposed activities at the project site:

	Existing	Change	Total
Withdrawal from groundwater	_____	_____	_____
Withdrawal from surface water	_____	_____	_____
Interbasin transfer	_____	_____	_____
Municipal or regional water supply	_____	_____	_____

B. If the source is a municipal or regional supply, has the municipality or region indicated that there is adequate capacity in the system to accommodate the project? ___ Yes ___ No

C. If the project involves a new or expanded withdrawal from a groundwater or surface water source,

1. have you submitted a permit application? ___ Yes ___ No; if yes, attach the application
2. have you conducted a pump test? ___ Yes ___ No; if yes, attach the pump test report

D. What is the currently permitted withdrawal at the proposed water supply source (in gallons/day)? _____Will the project require an increase in that withdrawal?___ Yes ___ No

D. Does the project site currently contain a water supply well, a drinking water treatment facility,

water main, or other water supply facility, or will the project involve construction of a new facility?

___ Yes ___ No. If yes, describe existing and proposed water supply facilities at the project site:

	Existing	Change	Total
Water supply well(s) (capacity, in gpd)	_____	_____	_____
Drinking water treatment plant (capacity, in gpd)	_____	_____	_____
Water mains (length, in miles)	_____	_____	_____

F. If the project involves any interbasin transfer of water, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed?

G. Does the project involve

1. new water service by a state agency to a municipality or water district? ___ Yes ___ No
2. a Watershed Protection Act variance? ___ Yes ___ No; if yes, how many acres of alteration?
3. a non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities? ___ Yes ___ No

H. Describe the project's other impacts (including indirect impacts) on water resources, quality, facilities and services:

III. Consistency -- Describe the project's consistency with water conservation plans or other plans to enhance water resources, quality, facilities and services:

WASTEWATER SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wastewater** (see 301 CMR 11.03(5))? ___ Yes _X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **wastewater**? ___ Yes _X_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Transportation -- Traffic Generation Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wastewater Section below.

II. Impacts and Permits

A. Describe, in gallons/day, the volume and disposal of wastewater generation for existing and proposed activities at the project site (calculate according to 310 CMR 15.00):

	Existing	Change	Total
Discharge to groundwater (Title 5)	_____	_____	_____
Discharge to groundwater (non-Title 5)	_____	_____	_____
Discharge to outstanding resource water	_____	_____	_____
Discharge to surface water	_____	_____	_____
Municipal or regional wastewater facility	_____	_____	_____
TOTAL	_____	_____	_____

B. Is there sufficient capacity in the existing collection system to accommodate the project? ___ Yes ___ No; if no, describe where capacity will be found:

C. Is there sufficient existing capacity at the proposed wastewater disposal facility?___ Yes ___ No; if no, describe how capacity will be increased:

D. Does the project site currently contain a wastewater treatment facility, sewer main, or other wastewater disposal facility, or will the project involve construction of a new facility?

___ Yes ___ No. If yes, describe as follows:

	Existing	Change	Total
Wastewater treatment plant (capacity, in gpd)	_____	_____	_____
Sewer mains (length, in miles)	_____	_____	_____
Title 5 systems (capacity, in gpd)	_____	_____	_____

E. If the project involves any interbasin transfer of wastewater, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed?

F. Does the project involve new sewer service by an Agency of the Commonwealth to a municipality or sewer district? ___ Yes ___ No

G. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of sewage sludge, sludge ash, grit, screenings, or other sewage residual materials? ___ Yes ___ No; if yes, what is the capacity (in tons per day):

	Existing	Change	Total
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

H. Describe the project's other impacts (including indirect impacts) on wastewater generation and treatment facilities:

III. Consistency -- Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to wastewater management:

A. If the project requires a sewer extension permit, is that extension included in a comprehensive wastewater management plan? ___ Yes ___ No; if yes, indicate the EOEA number for the plan and describe the relationship of the project to the plan

TRANSPORTATION -- TRAFFIC GENERATION SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **traffic generation** (see 301 CMR 11.03(6))? ___ Yes _X__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **state-controlled roadways**? ___ Yes _X__ No; if yes, specify which permit:

The project does not generate any new traffic in the area or create any parking spaces. It will cause temporary changes in traffic flow patterns. No thresholds will be exceeded and no state level permits will be required. The construction specifications for the project will address the issues relating to traffic management in conformance with all regulatory requirements.

C. If you answered "No" to both questions A and B, proceed to the **Roadways and Other Transportation Facilities Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Traffic Generation Section below.

II. Traffic Impacts and Permits

A. Describe existing and proposed vehicular traffic generated by activities at the project site:

	Existing	Change	Total
Number of parking spaces	_____	_____	_____
Number of vehicle trips per day	_____	_____	_____
ITE Land Use Code(s):			

B. What is the estimated average daily traffic on roadways serving the site?

	Roadway	Existing	Change	Total
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____

C. Describe how the project will affect transit, pedestrian and bicycle transportation facilities and services:

III. Consistency -- Describe measures that the proponent will take to comply with municipal, regional, state, and federal plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services:

ROADWAYS AND OTHER TRANSPORTATION FACILITIES SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **roadways or other transportation facilities** (see 301 CMR 11.03(6))? _X__ Yes ___ No; if yes, specify, in quantitative terms:

The project will result in the cutting of five or more living public shade trees of 14 or more inches diameter at breast height (301 CMR 11.03(6)(b)2.b.).

On the Boston side of the bridge, sixteen (16) existing trees will be removed, eight of which have a diameter greater than 14 inches. On the Cambridge side of the bridge, sixty (60) existing trees will be removed, four of which have a diameter greater than 14 inches. Of all the trees proposed for removal, twelve (12) are considered public shade trees with a dbh greater than 14 inches.

The trees that will be removed fall into one or a combination of the following four categories: (i) "Volunteer" trees that have taken root too close to the bridge structure or in the rip rap erosion control and are having a destructive impact on the structure; (ii) trees that are located in the construction staging area (some of which are invasive species) that will be restored in accordance with the *Charles River Basin Master Plan*; (iii) trees that are in poor condition; and/or (iv) trees that are in a poor location that compromise public safety. More specific information on tree removal and restoration is provided in Landscaping Plans Sheets L1-6 in Attachment 2 and Tree Removal Tables in Attachment 7.

B. Does the project require any state permits related to **roadways or other transportation facilities**? ___ Yes _X__ No; if yes, specify which permit:

The project involves a roadway facility, however it will not increase the roadway capacity and it will not create additional roadway connections beyond those already existing. No thresholds will be exceeded and no state level permits will be required.

C. If you answered "No" to both questions A and B, proceed to the **Energy Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Roadways Section below.

II. Transportation Facility Impacts

A. Describe existing and proposed transportation facilities at the project site:

	Existing	Change	Total
Length (in linear feet) of new or widened roadway	_440 ft___	___0_____	_440 ft__
Width (in feet) of new or widened roadway	_41.5 ft	___0_____	_41.5 ft_

Other transportation facilities:

B. Will the project involve any
1. Alteration of bank or terrain (in linear feet)? __0___
2. Cutting of living public shade trees (number)? __12__
3. Elimination of stone wall (in linear feet)? __0___

III. Consistency -- Describe the project's consistency with other federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services, including consistency with the applicable regional transportation plan and the Transportation Improvements Plan (TIP), the State Bicycle Plan, and the State Pedestrian Plan:

The project is consistent with federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services. The project will improve universal accessibility, pedestrian, and bicycle access in the immediate area, which is consistent with MassDOT's goals for its facilities as well as those of the City of Boston and the City of Cambridge, and other state and federal agencies.

ENERGY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **energy** (see 301 CMR 11.03(7))? ___ Yes _X__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **energy**? ___ Yes _X__ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Air Quality Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Energy Section below.

II. Impacts and Permits

A. Describe existing and proposed energy generation and transmission facilities at the project site:

	Existing	Change	Total
Capacity of electric generating facility (megawatts)	_____	_____	_____
Length of fuel line (in miles)	_____	_____	_____
Length of transmission lines (in miles)	_____	_____	_____
Capacity of transmission lines (in kilovolts)	_____	_____	_____

B. If the project involves construction or expansion of an electric generating facility, what are
1. the facility's current and proposed fuel source(s)?
2. the facility's current and proposed cooling source(s)?

C. If the project involves construction of an electrical transmission line, will it be located on a new, unused, or abandoned right of way?___ Yes ___ No; if yes, please describe:

D. Describe the project's other impacts on energy facilities and services:

III. Consistency -- Describe the project's consistency with state, municipal, regional, and federal plans and policies for enhancing energy facilities and services:

AIR QUALITY SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **air quality** (see 301 CMR 11.03(8))? ___ Yes _X__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **air quality**? ___ Yes _X__ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Solid and Hazardous Waste Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Air Quality Section below.

II. Impacts and Permits

A. Does the project involve construction or modification of a major stationary source (see 310 CMR 7.00, Appendix A)?___ Yes ___ No; if yes, describe existing and proposed emissions (in tons per day) of:

	Existing	Change	Total
Particulate matter	_____	_____	_____
Carbon monoxide	_____	_____	_____
Sulfur dioxide	_____	_____	_____
Volatile organic compounds	_____	_____	_____
Oxides of nitrogen	_____	_____	_____
Lead	_____	_____	_____
Any hazardous air pollutant	_____	_____	_____
Carbon dioxide	_____	_____	_____

B. Describe the project's other impacts on air resources and air quality, including noise impacts:

III. Consistency

A. Describe the project's consistency with the State Implementation Plan:

B. Describe measures that the proponent will take to comply with other federal, state, regional, and local plans and policies related to air resources and air quality:

SOLID AND HAZARDOUS WASTE SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **solid or hazardous waste** (see 301 CMR 11.03(9))? ___ Yes X___ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **solid and hazardous waste**? __ Yes __ No; if yes, specify which permit:

Materials testing will occur prior to demolition to determine whether any permit requirements will be triggered. The construction specifications for the project will address the issue of appropriate management and disposal of these materials in conformance with all regulatory requirements.

C. If you answered "No" to both questions A and B, proceed to the **Historical and Archaeological Resources Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Solid and Hazardous Waste Section below.

II. Impacts and Permits

A. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of solid waste? ___ Yes _X__ No; if yes, what is the volume (in tons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____
Combustion	_____	_____	_____

Disposal	_____	_____	_____

B. Is there any current or proposed facility at the project site for the storage, recycling, treatment or disposal of hazardous waste? ___ Yes _X__ No; if yes, what is the volume (in tons or gallons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Recycling	_____	_____	_____
Treatment	_____	_____	_____
Disposal	_____	_____	_____

C. If the project will generate solid waste (for example, during demolition or construction), describe alternatives considered for re-use, recycling, and disposal:

Demolition materials (e.g. steel, concrete, and asphalt) will be recycled to the extent practicable. The construction specifications for the project will address the issue of appropriate management and disposal of these materials in conformance with all regulatory requirements.

D. If the project involves demolition, do any buildings to be demolished contain asbestos?

___ Yes _X__ No;

Materials testing will be undertaken prior to demolition of hidden materials to determine if asbestos is present in the utility duct bank or other materials. The construction specifications for the project will address the issue of appropriate management and disposal of these materials in conformance with all regulatory requirements.

E. Describe the project's other solid and hazardous waste impacts (including indirect impacts):

III. Consistency--Describe measures that the proponent will take to comply with the State Solid Waste Master Plan: Demolition materials (e.g., steel, concrete, asphalt) will be recycled to the extent practicable. Debris that cannot be practically reused and/or recycled will be disposed of in accordance with applicable regulations.

HISTORICAL AND ARCHAEOLOGICAL RESOURCES SECTION

I. Thresholds / Impacts

A. Is any part of the project site a historic structure, or a structure within a historic district, in either case listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? _X__ Yes ___ No; if yes, does the project involve the demolition of all or any exterior part of such historic structure? ___ Yes __X_ No; if yes, please describe:

The Anderson Memorial Bridge is a contributing element in the National/State Register-listed Charles River Basin Historic District. The rehabilitation project includes the repair/replacement of the concrete spandrel walls and parapets, repair/replacement of the concrete arch and miscellaneous repairs to other elements of the bridge structure, and repair/replacement of the brick architectural features and bridge lighting system. All of the elements deemed critical to the bridge's historic/architectural character will be treated in accordance with the *Secretary of Interior's Standards for Restoration*, while elements of lesser or no historic/architectural significance will be treated in accordance with the *Secretary of Interior's Standards for Rehabilitation*.

B. Is any part of the project site an archaeological site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? _X__ Yes ___ No; if yes, does the project involve the destruction of all or any part of such archaeological site? ___ Yes ___ No; if yes, please describe:

One inventoried pre-contact archaeological site is within the project area. The site is identified as 19-MD-173 in the Commonwealth's Inventory of Historic and Archaeological Assets. The Inventory form for this site indicates that the site has been destroyed, but MassDOT will complete a reconnaissance survey of the area to make sure that there is no potential disturbance to any additional archeological sites within the project area.

C. If you answered "No" to all parts of both questions A and B, proceed to the **Attachments and Certifications** Sections. If you answered "Yes" to any part of either question A or question B, fill out the remainder of the Historical and Archaeological Resources Section below.'

D. Have you consulted with the Massachusetts Historical Commission? _X__ Yes ___ No; if yes, attach correspondence.

See Attachment 8 for correspondence dated 2/22/2010. Additional correspondence with the Massachusetts Historical Commission is in Attachment 6, regarding the underpass feasibility study.

The MassDOT Cultural Resources Unit, in consultation with the Boston Landmarks Commission, Cambridge Historical Commission, Massachusetts Historical Commission, and DCR's Office of Cultural Resources, is conducting a full review of the project in compliance with the regulations governing Chapter 254 to address effects the project may have on the historic resources identified above.

E. Describe and assess the project's other impacts, direct and indirect, on listed or inventoried historical and archaeological resources:

The area surrounding the Anderson Memorial Bridge contains historic resources or districts that are listed or eligible for listing in the National Register that includes: the Charles River Basin Historic District; Harvard's Weld Boathouse; Harvard Houses National Register Historic District; Harvard Stadium Fence and the Harvard athletic facilities within the area enclosed by the fence including the iconic 1903 Harvard Stadium, which is a designated National Historic Landmark; and the Harvard Business School.

The proposed stormwater measures and landscaping plan associated with the bridge rehabilitation will impact the adjacent parkland, which is within the Charles River Basin Historic District. Additionally the land between the bridge and Harvard's Weld Boathouse is being considered as a possible location for a stormwater BMP.

None of these historic resources will be directly impacted by the proposed project. The project's visual impacts on these properties will be minimal and most likely positive. MassDOT will complete an archaeological reconnaissance survey to ensure that no unknown sites will be disturbed by the installation of stormwater systems, landscaping or other bridge work.

II. Consistency -- Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources:

The purpose of this project is to repair the structure of the Anderson Memorial Bridge to meet the current transportation needs and extend the life of the bridge. The project goals are compatible with those detailed in DCR's *Master Plan for the Charles River Basin* and those of the Massachusetts Historical Commission's *Massachusetts State Historic Preservation Plan 2006-2010*. MassDOT continuing consultation with the Massachusetts Historical Commission and other consulting parties will ensure that the historic preservation goals for the Anderson Memorial Bridge project are achieved.

ATTACHMENTS:

1. Plan, at an appropriate scale, of existing conditions of the project site and its immediate context, showing all known structures, roadways and parking lots, rail rights-of-way, wetlands and water bodies, wooded areas, farmland, steep slopes, public open spaces, and major utilities.
2. Plan of proposed conditions upon completion of project (if construction of the project is proposed to be phased, there should be a site plan showing conditions upon the completion of each phase).
3. **Original** U.S.G.S. map or good quality **color** copy (8-½ x 11 inches or larger) indicating the project location and boundaries
4. List of all agencies and persons to whom the proponent circulated the ENF, in accordance with 301 CMR 11.16(2).
5. Other: **Bridge Rehabilitation Recommendation Memorandum**
6. Other: **Bike and Pedestrian Underpass Feasibility Study and Correspondence**
7. Other: **Tree Removal Tables**
8. Other: **Early Coordination Correspondence**
9. Other: **Design Public Hearing Presentation**

CERTIFICATIONS:

1. The Public Notice of Environmental Review has been/will be published in the following newspapers in accordance with 301 CMR 11.15(1):

(Name)	(Date)
Boston Globe	Prior to 2/9/2011
Boston Herald	Prior to 2/9/2011
Cambridge Chronicle	Prior to 2/9/2011

2. This form has been circulated to Agencies and Persons in accordance with 301 CMR 11.16(2).

1/31/2011
Date

for Administrator
MassDOT Highway Division

1/31/2011
Date

Signature of Responsible Officer or Proponent

1/27/11
Date

Signature of person preparing ENF (if different from above)

Name: Michael Trepanier

Agency: MassDOT Highway Division, Environmental Services

Street: 10 Park Plaza, Suite 4600

Municipality/State/Zip: Boston, MA 02116

Phone: 617-973-8250

Name: Denise Bartone

Firm: CDW Consultants, Inc.

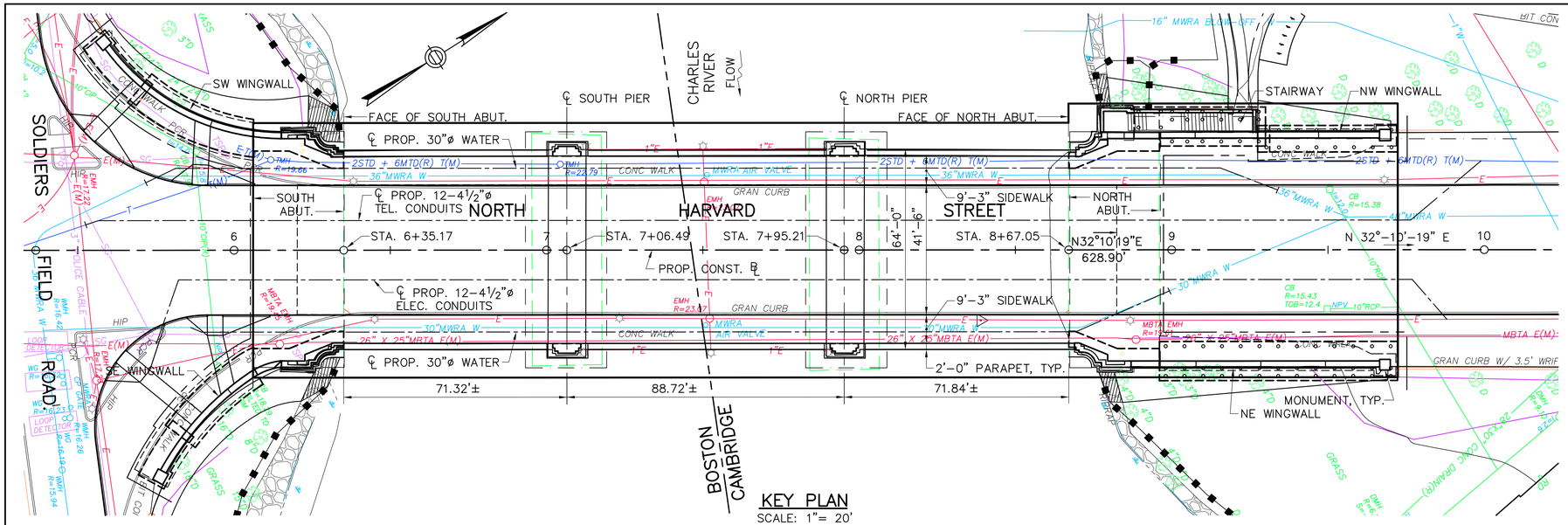
Street: 40 Speen Street, Suite 301

Municipality/State/Zip: Framingham, MA 01701

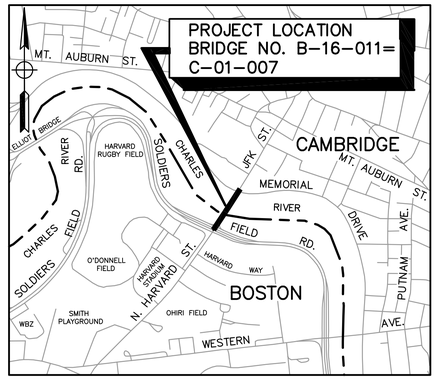
Phone: 508-875-2657 x19

ATTACHMENT 1

Existing Conditions Plans



KEY PLAN
SCALE: 1"= 20'



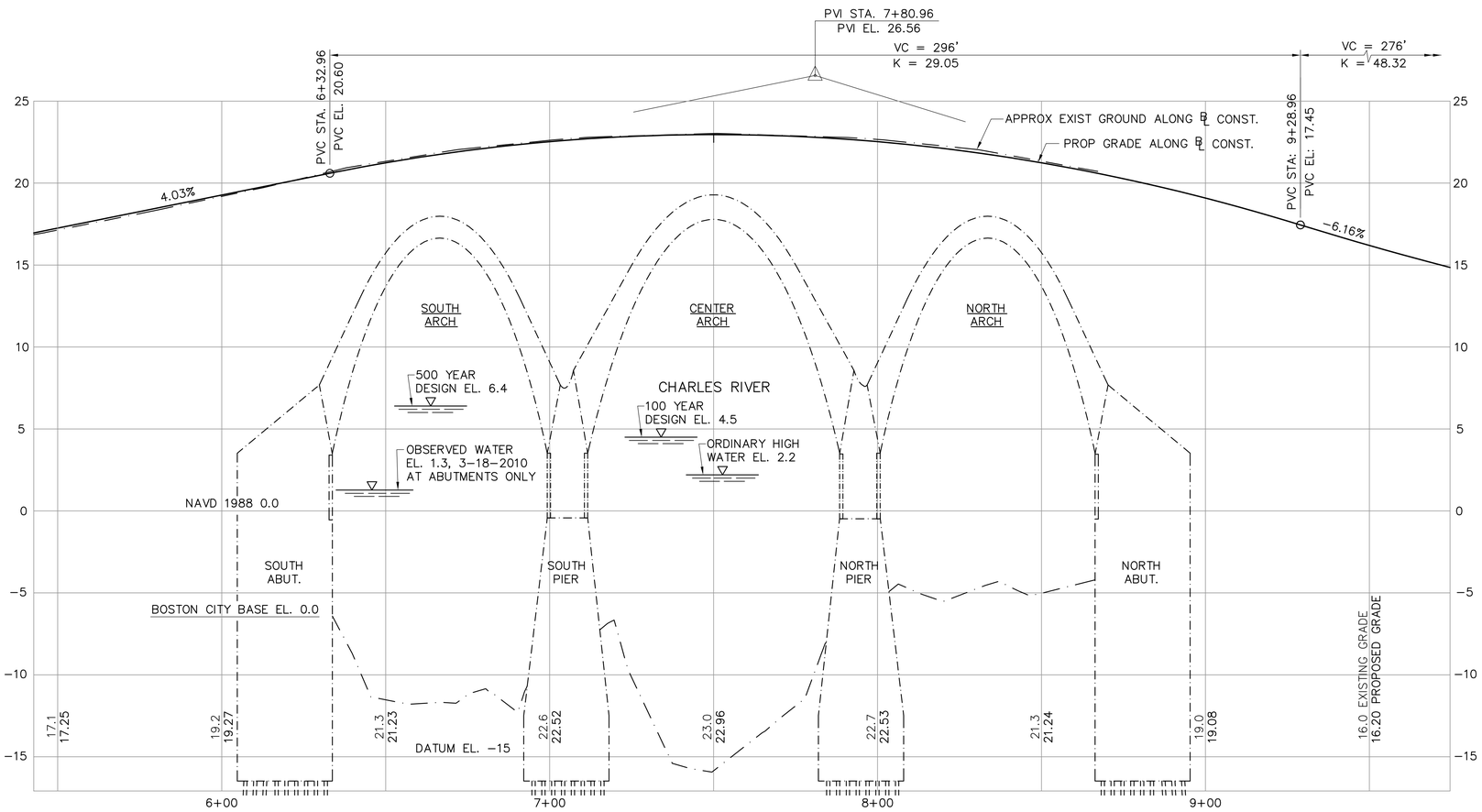
LOCUS
SCALE 1:1000

0 1000 2000 3000

SCALE IN FEET

NOTES:
NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.

2. SEE HIGHWAY PLANS FOR PROJECT LIMITS.



PROFILE – NORTH HARVARD ST. OVER CHARLES RIVER
SCALE: HORIZ. 1"= 20'
VERT. 1"= 4'

DES.	DR.	EST.
CHK.	CHK.	CHK.
BSK	RAT	---
PFH	BSK	---

FS & T FILE NO. VQ-061

ENGINEER IN CHARGE

FAY, SPOFFORD & THORNDIKE, LLC
BOSTON, MA – BURLINGTON, MA
BEDFORD, NH

Moving Massachusetts Forward
massDOT Highway

SKETCH PLAN OF PROPOSED BRIDGE REHABILITATION

BOSTON/CAMBRIDGE

NORTH HARVARD STREET OVER THE CHARLES RIVER

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

APPROVED BY DATE

STRUCTURAL ELEMENTS:

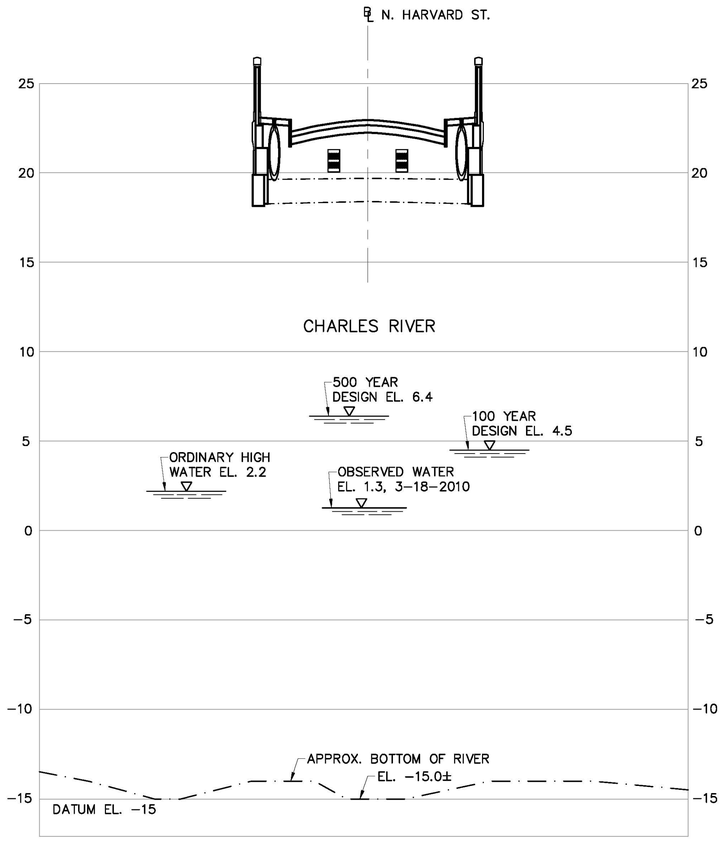
TITLE:

HIGHWAY ELEMENTS:

TITLE:

SHEET 1 OF 12 SHEETS BRIDGE NO. B–16–011=C–01–007 (4F2)

R:\VQ–061 Larz Anderson\03 CADD\Structural\Contract Drawings\25%Submission\ENF ATT 1 DRAWINGS\01–KEYPL&TITLE.dwg 01/13/11 11:21 [39.24] By Goodri_C



PROFILE – CHARLES RIVER UNDER NORTH HARVARD ST.
SCALE: HORIZ. 1"= 20'
VERT. 1"= 4'

GENERAL NOTES		
PROJECT FILE NO. : 605517		
TYPE OF PROJECT: REHABILITATION		
BRIDGE DESIGN LOADING: HL−93		
SURVEY: ELECTRONIC FILES WITH MASSDOT		
ELEVATION REFERENCE: NAVD 1988		
TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2034	
AVERAGE DAILY TRAFFIC−PRESENT (2014)	23,100 Vpd	
AVERAGE DAILY TRAFFIC−DESIGN YEAR	24,300 Vpd	
DESIGN HOUR VOLUME	1,900	
DIRECTIONAL DISTRIBUTION	60%	
TRUCK PERCENTAGE−AVERAGE DAY	3%	
TRUCK PERCENTAGE−PEAK HOUR	3%	
DESIGN SPEED	30 MPH	
DIRECTIONAL DESIGN HOUR VOLUME	1,140	

BENCH MARKS:

STA. 8+38.89, 51' RT
#109 DH SET, N 2959759.81, E 758061.53, ELEVATION 21.76

STA. 11+44.61, 30.24' LT
#112 DH SET, N 2960046.68, E 758179.66, ELEVATION 8.73

DESIGN:

IN ACCORDANCE WITH THE 2007 AASHTO LRFD DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2009 FOR HL−93 LOADING.

HYDRAULIC DATA

DRAINAGE AREA: _____ 290 SQUARE MILES
DESIGN DISCHARGE: _____ 19,110 CUBIC FEET PER SECOND
DESIGN FREQUENCY: _____ 500 YEARS
DESIGN VELOCITY: _____ 5.7 FEET PER SECOND
DESIGN HIGH WATER: ELEVATION_____ 6.4 FEET

BASIC FLOOD DATA

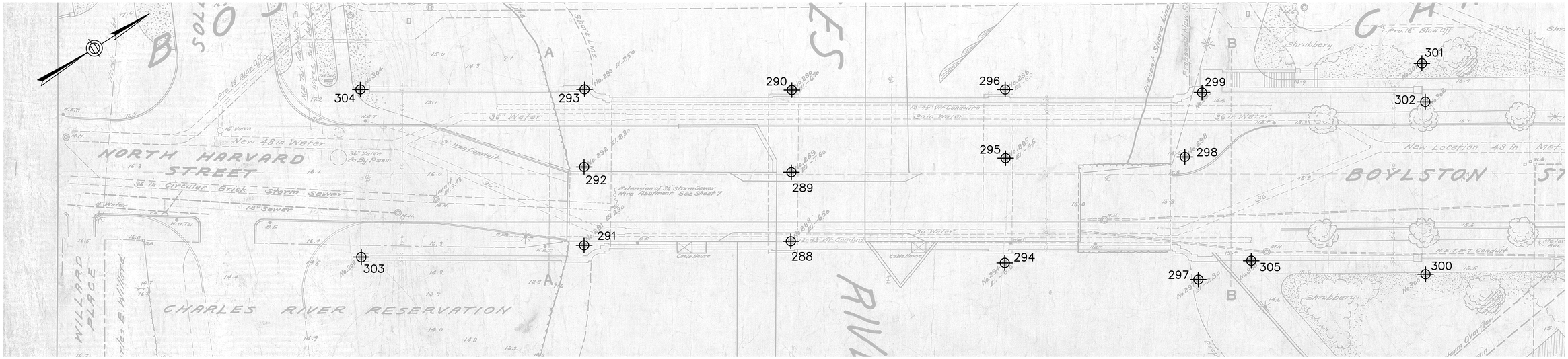
Q (100 YEAR): _____ 14,700 CUBIC FEET PER SECOND
WATER SURFACE ELEVATION: _____ 4.5 FEET

FLOOD OF RECORD

Q(CUBIC FEET PER SECOND)_____ NO RECORD
FREQUENCY (IF KNOWN): _____ NO RECORD
DATE: _____ NO RECORD
HISTORY OF ICE FLOES: _____ NO RECORD
EVIDENCE OF SCOUR AND EROSION: ___ NO RECORD

DES.	DR.	EST.
BSK	RAT	---
CHK.	CHK.	CHK.
PFH	BSK	---

FS & T FILE NO. VQ−061
ENGINEER IN CHARGE

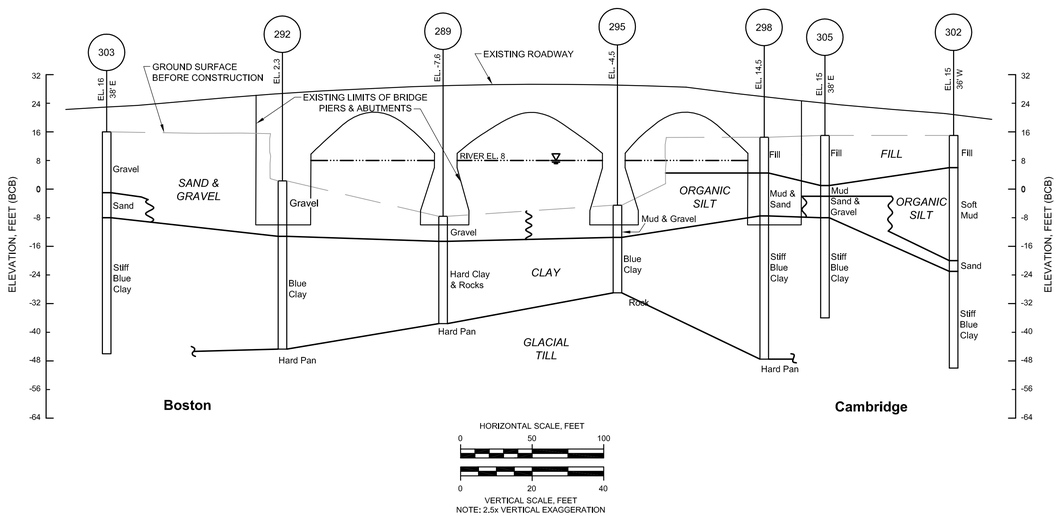


EXISTING BORING PLAN–1912

SCALE: 1"=20'

LEGEND:

303 ⊕ BORINGS TAKEN 1912



SUBSURFACE PROFILE

RESULTS OF BORINGS

288 6 ft. Gravel
21 " Hard Clay & Rocks
to Rock

289 7 ft. Gravel
23 " Hard Clay & Rocks
to Hard Pan

290 6 ft. Gravel
28 " Blue Clay
to Hard Pan

291 15 ft. Gravel
28 " Blue Clay
to Hard Pan

292 15'-6" Gravel
31'-6" Blue Clay
to Hard Pan

293 11 ft. Coarse Gravel
30 " Blue Clay
to Hard Pan

294 13 ft. Mud
13'-6" Blue Clay
to Hard Pan

295 9 ft. Mud & Gravel
15'-6" Blue Clay
to Rock

296 6 ft. Gravel
20 " Blue Clay
to Hard Pan, Rock

297 10'-6" Mud & Rocks
27 ft. Stiff Blue Clay
to Rock

298 10 ft. Filling
12 " Mud & Sand
40 Stiff Blue Clay
to Hard Pan

299 10 ft. Filling
10 " Mud
5 " Sand & Gravel
38 " Stiff Blue Clay
1 " Hard Pan
to Rock

300 10 ft. Filling
16 " Soft Mud
3 " Sand
27 " Stiff Blue Clay

301 7 ft. Filling
27 " Soft Mud
2 " Gravel
to Boulder

302 9 ft. Filling
26 " Soft Mud
3 " Sand
27 " Stiff Blue Clay

303 17 ft. Gravel
7 " Quick Sand
38 " Stiff Blue Clay

304 19 ft. Gravel
6 " Fine Sand
40 " Stiff Blue Clay
to Hard Pan

305 14 ft. Filling
3 " Mud
6 " Gravel & Sand
28 " Stiff Blue Clay

LEGEND

B504 — BORING NUMBER

EL. 14.5 55' E — ELEVATION OF GROUND SURFACE AND OFFSET OF BORING FROM CENTERLINE OF BRIDGE

EXISTING GROUND SURFACE

CLAY — STRATUM NAME

STRATUM BOUNDARY

STIFF BLUE CLAY — DESCRIPTION FROM BORING

NOTES

1. BORING LOCATIONS AND LOGS ARE TAKEN FROM THE 1912 PLANS.
2. THE BOUNDARIES BETWEEN SOIL STRATA MAY BE TRANSITIONAL. THE STRATA BOUNDARIES BETWEEN BORINGS MAY VARY SIGNIFICANTLY FROM THE INTERPOLATIONS SHOWN.
3. EL. 0.0 BOSTON CITY BASE (BCB) = EL. −6.46 NAVD 1988.
4. PROFILE ALONG CENTERLINE OF BRIDGE LOOKING WEST.

DES.	DR.	EST.
BSK	RAT	---
CHK.	CHK.	CHK.
PFH	BSK	---

FS & T FILE NO. VQ-061

ENGINEER IN CHARGE

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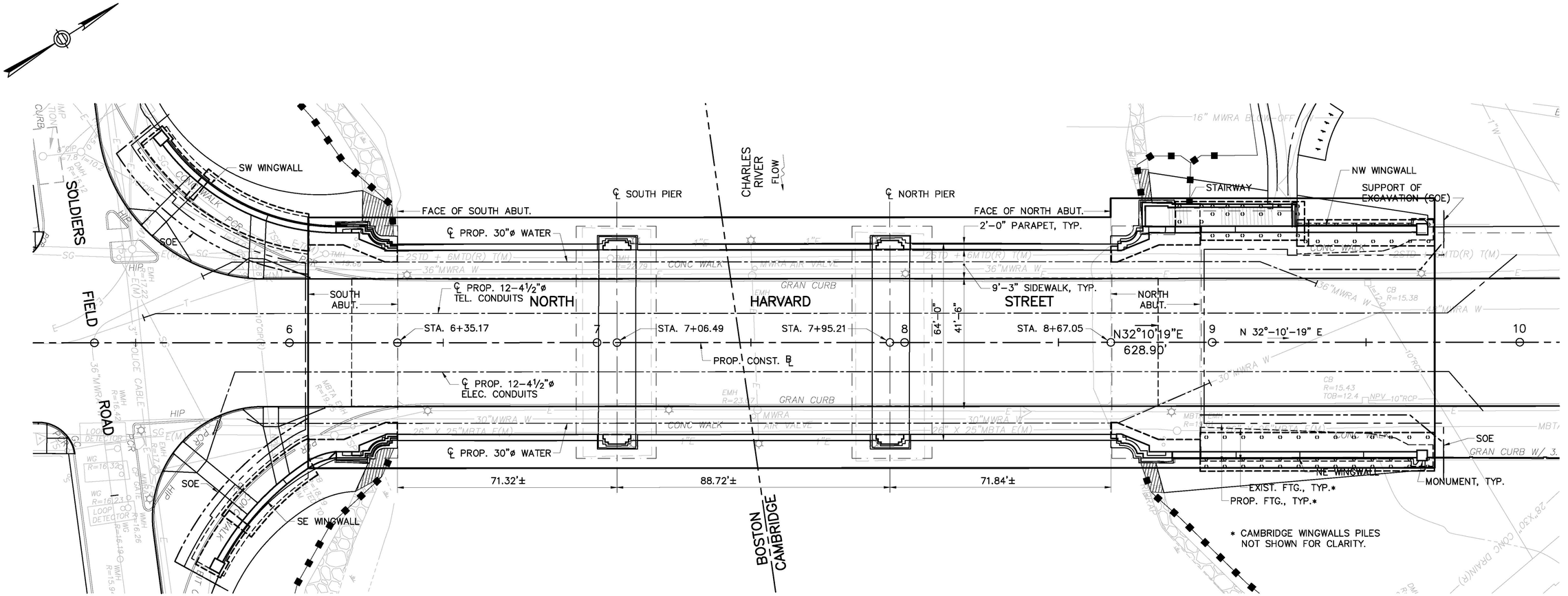
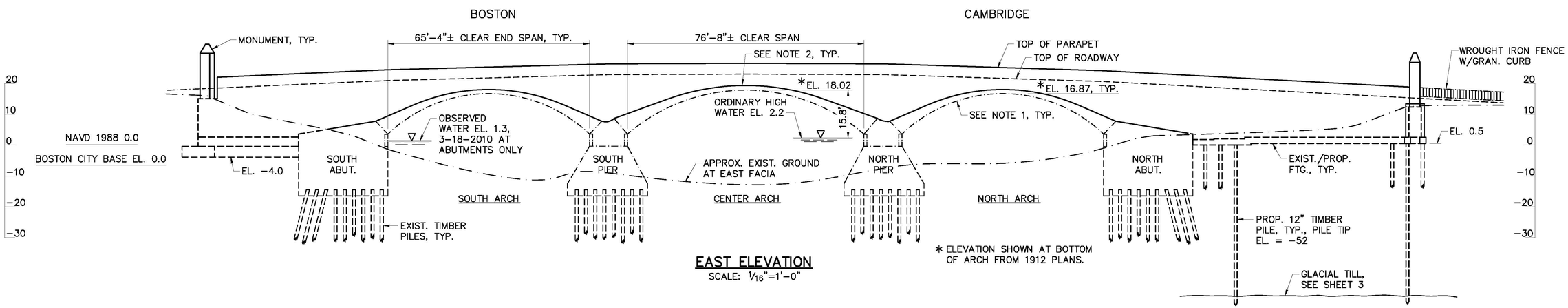


DECK PLAN
SCALE: 1/16"=1'–0"



EAST ELEVATION
SCALE: 1/16"=1'–0"

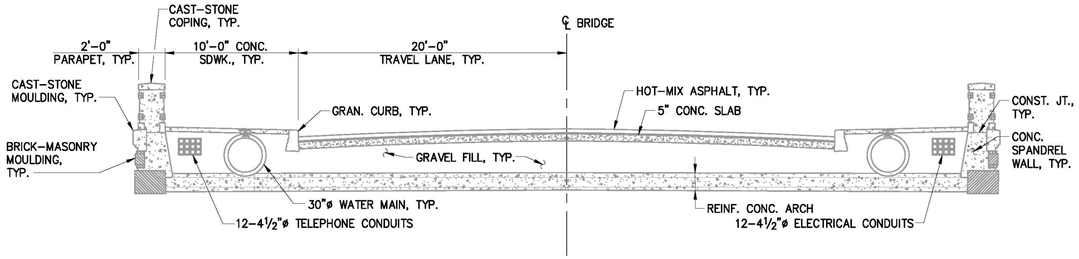
NOTES:

1. REPAIRS TO THE UNDERSIDE OF THE ARCH SHALL BE DONE ON ONE SPAN AT A TIME. TWO ARCH SPANS SHALL BE OPEN TO NAVIGATION AT ALL TIMES DURING CONSTRUCTION.
2. REPAIR THE TOP SURFACE OF THE ARCHES AND REHABILITATE THE EXISTING WEEP HOLES.

DES.	DR.	EST.
PFH	BSK	---
CHK.	CHK.	CHK.
BSK	RAT	---

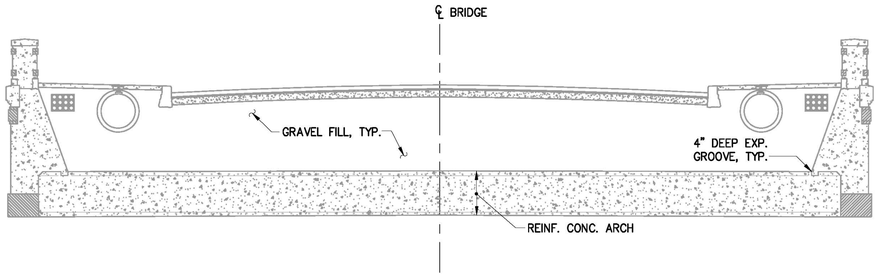
FS & T FILE NO. VQ–061 ENGINEER IN CHARGE

R:\VQ–061 Larz Anderson\03 CADD\Structural\Contract Drawings\25%Submission\ENF ATT 1 DRAWINGS\04–DECK PL & EL.dwg 01/13/11 11:24 [33.98] By Goodri_C



EXISTING CROSS SECTION AT CROWN

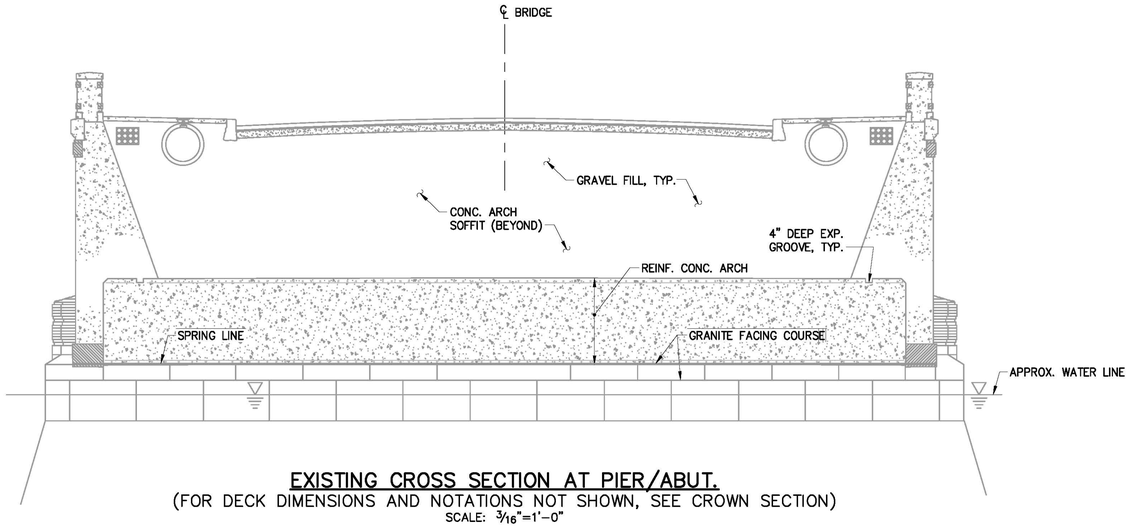
SCALE: 3/16"=1'-0"



EXISTING INTERMEDIATE CROSS SECTION

(FOR DECK DIMENSIONS AND NOTATIONS NOT SHOWN, SEE CROWN SECTION)

SCALE: 3/16"=1'-0"



EXISTING CROSS SECTION AT PIER/ABUT.

(FOR DECK DIMENSIONS AND NOTATIONS NOT SHOWN, SEE CROWN SECTION)

SCALE: 3/16"=1'-0"

NOTES:

1. ALL EXISTING INFORMATION IS BASED ON THE SURVEY AND THE AVAILABLE CONSTRUCTION PLANS.

PFH	BSK	---	
CHK.	CHK.	CHK.	
BSK	RAT	---	
DES.	DR.	EST.	

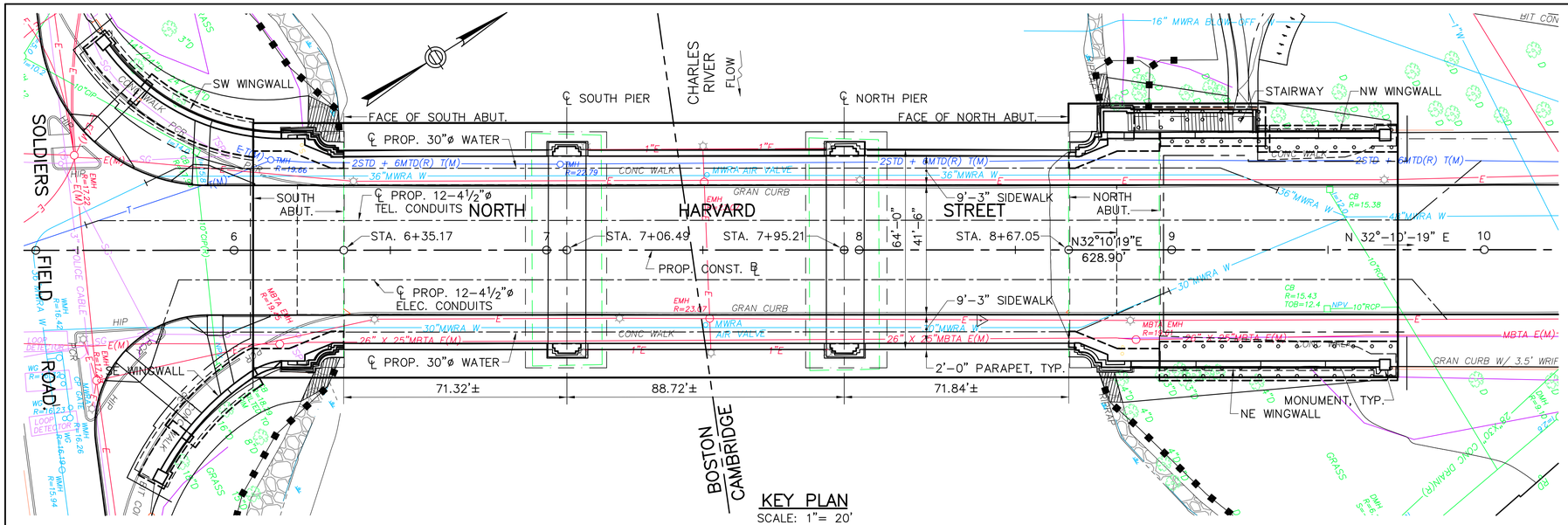
FS & T FILE NO. VQ-061

ENGINEER IN CHARGE

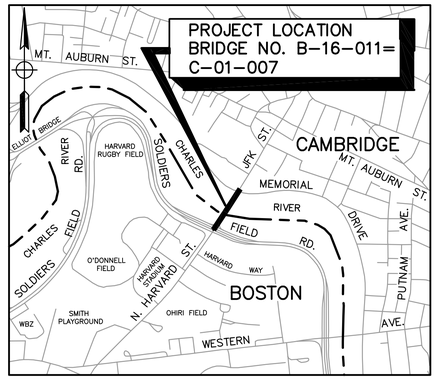
R:\VQ-061 Larz Anderson\03 CADD\Structural\Contract Drawings\25%Submission\ENF ATT 1 DRAWINGS\05-TYP_EXIST_SECTIONS.dwg 01/13/11 11:24 [28.01] By Goodri_C

ATTACHMENT 2

Plans of Proposed Conditions



KEY PLAN
SCALE: 1"= 20'



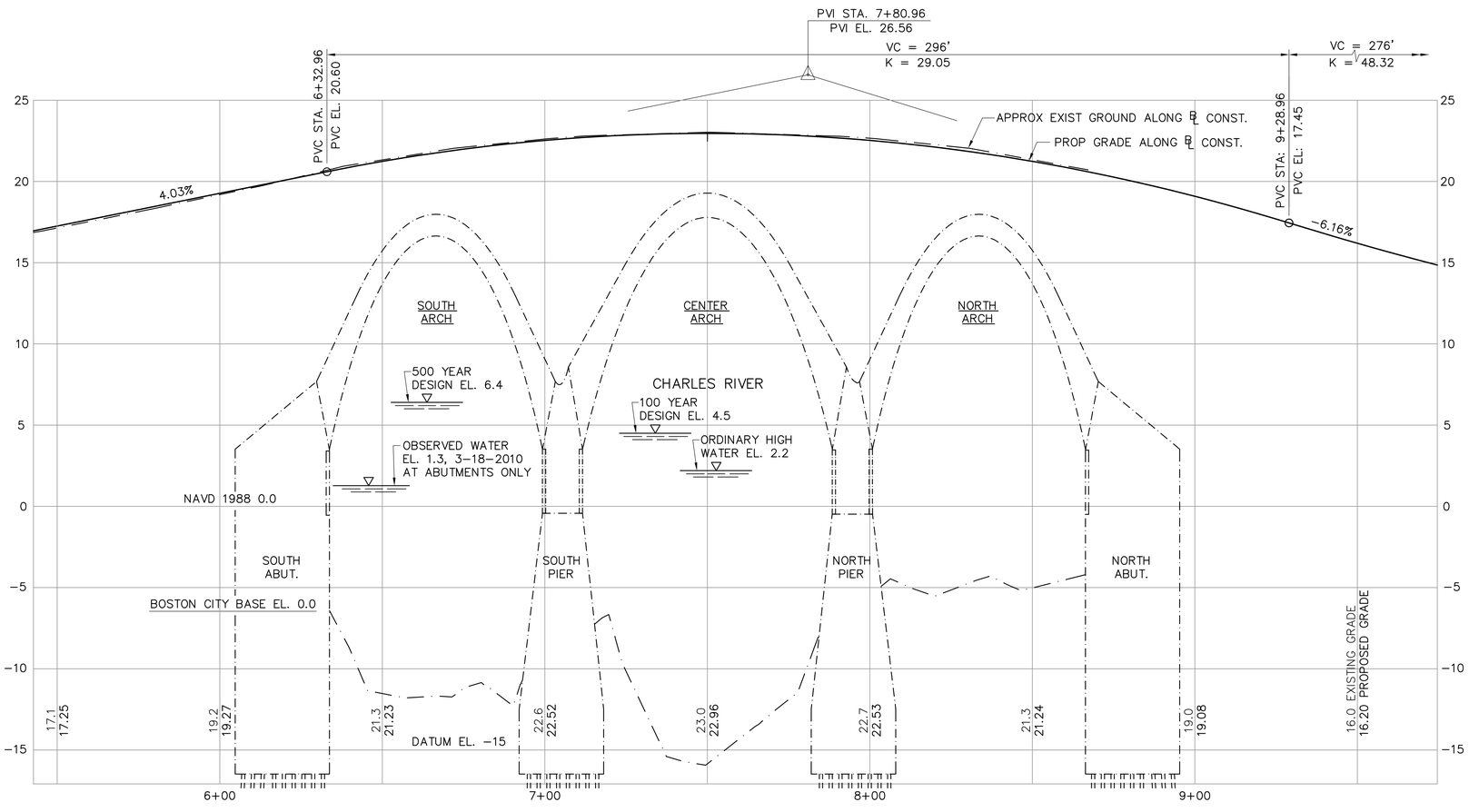
LOCUS
SCALE 1:1000

0 1000 2000 3000

SCALE IN FEET

NOTES:

1. NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
2. SEE HIGHWAY PLANS FOR PROJECT LIMITS.



PROFILE – NORTH HARVARD ST. OVER CHARLES RIVER
SCALE: HORIZ. 1"= 20'
VERT. 1"= 4'

DES.	DR.	EST.
BSK	RAT	---
CHK.	CHK.	CHK.
PFH	BSK	---

FS & T FILE NO. VQ-061

ENGINEER IN CHARGE

FAY, SPOFFORD & THORNDIKE, LLC
BOSTON, MA – BURLINGTON, MA
BEDFORD, NH

Moving Massachusetts Forward
massDOT Highway

SKETCH PLAN OF PROPOSED
BRIDGE REHABILITATION

BOSTON/CAMBRIDGE

NORTH HARVARD STREET
OVER THE CHARLES RIVER

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

APPROVED BY DATE

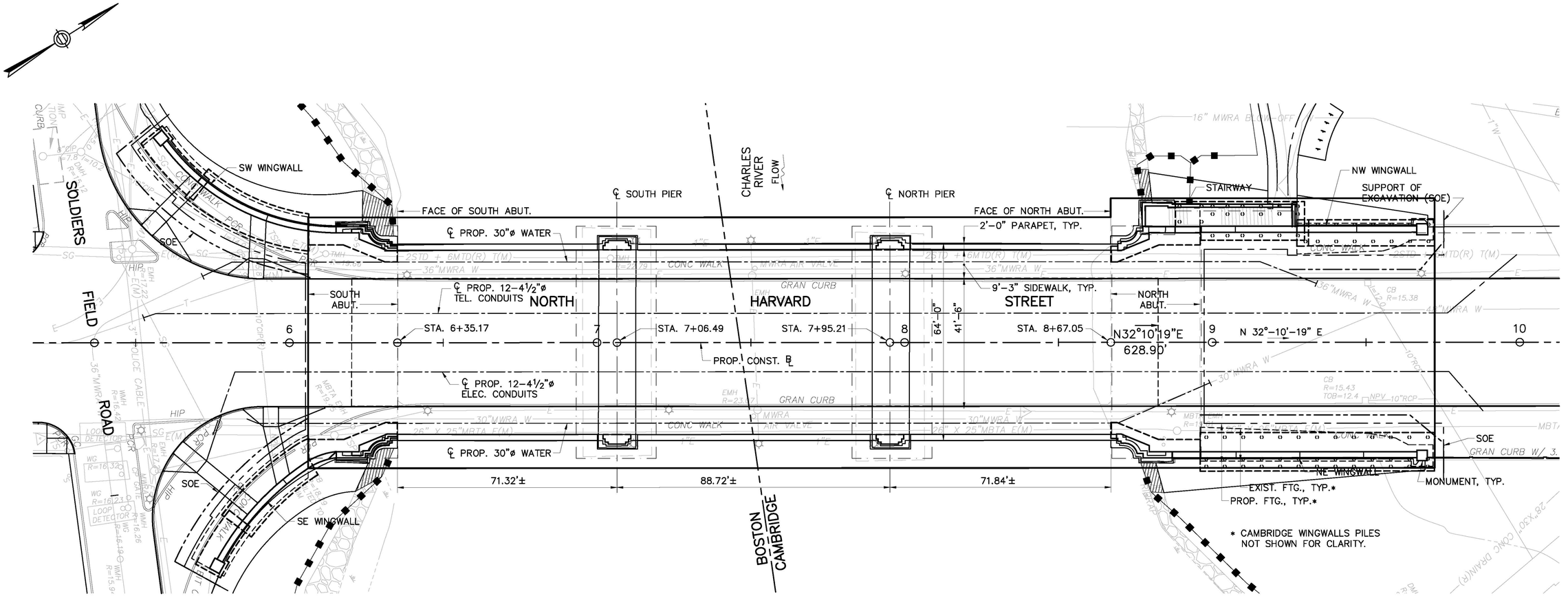
STRUCTURAL ELEMENTS:

TITLE:

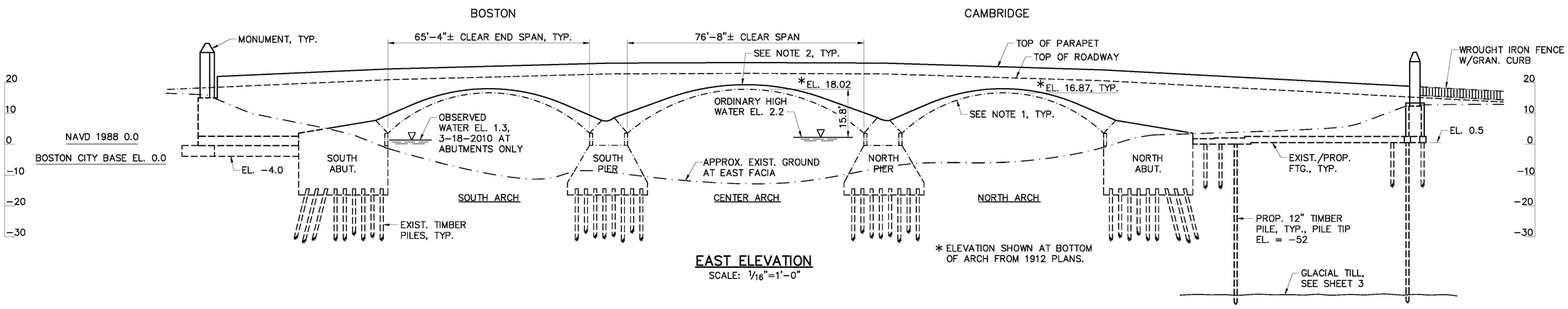
HIGHWAY ELEMENTS:

TITLE:

R:\VQ–061 Larz Anderson\03 CADD\Structural\Contract Drawings\25%Submission\ENF ATT 2 DRAWINGS\01–KEYPL&TITLE.dwg 01/13/11 11:28 [39.19] By Goodri_C



DECK PLAN
SCALE: 1/16"=1'–0"



EAST ELEVATION
SCALE: 1/16"=1'–0"

NOTES:

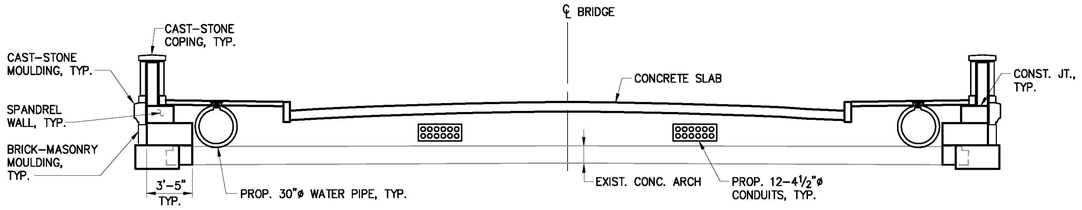
1. REPAIRS TO THE UNDERSIDE OF THE ARCH SHALL BE DONE ON ONE SPAN AT A TIME. TWO ARCH SPANS SHALL BE OPEN TO NAVIGATION AT ALL TIMES DURING CONSTRUCTION.
2. REPAIR THE TOP SURFACE OF THE ARCHES AND REHABILITATE THE EXISTING WEEP HOLES.

DES.	DR.	EST.
PFH	BSK	---
CHK.	CHK.	CHK.
BSK	RAT	---

FS & T FILE NO. VQ–061

ENGINEER IN CHARGE

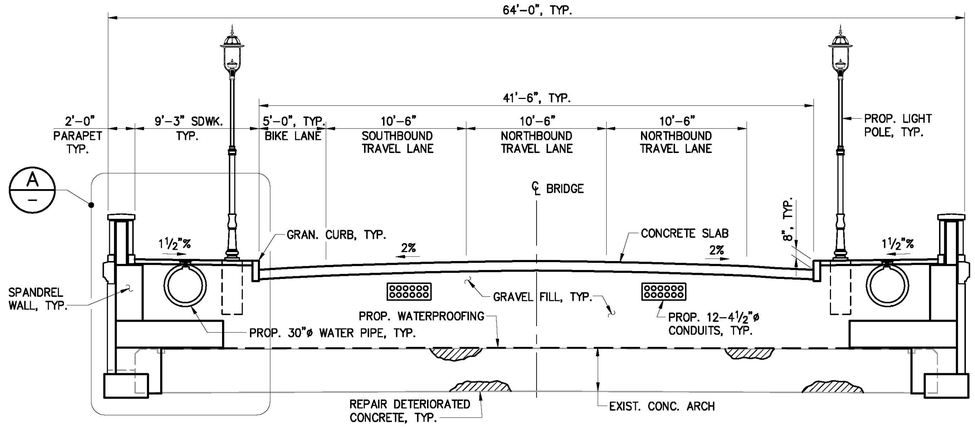
R:\VQ–061 Larz Anderson\03 CADD\Structural\Contract Drawings\25%Submission\ENF ATT 2 DRAWINGS\04–DECK PL & EL.dwg 01/13/11 11:29 [33.99] By Goodri_C



PROPOSED CROSS SECTION AT CROWN

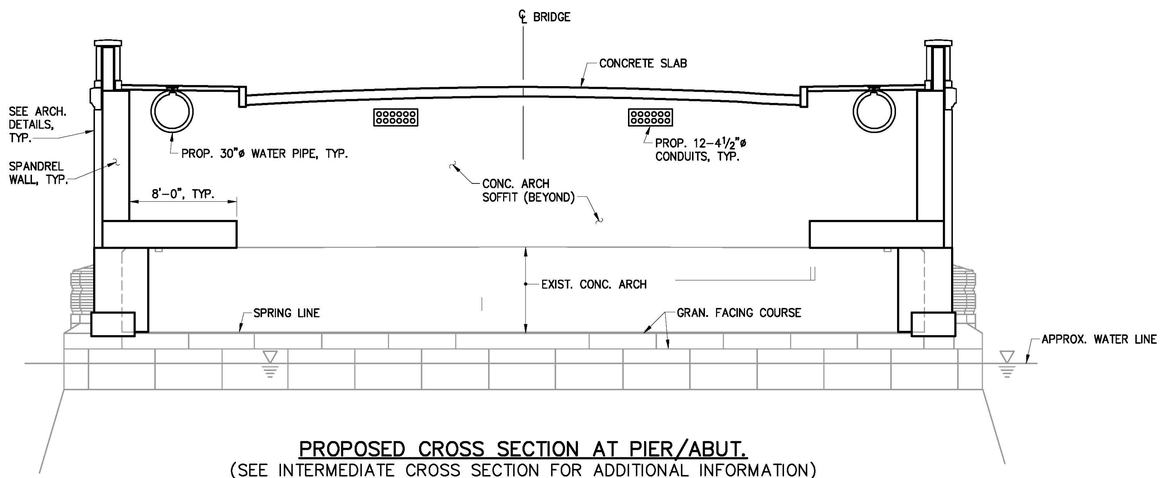
(SEE INTERMEDIATE CROSS SECTION FOR ADDITIONAL INFORMATION)

SCALE: 3/16"=1'-0"



PROPOSED INTERMEDIATE CROSS SECTION

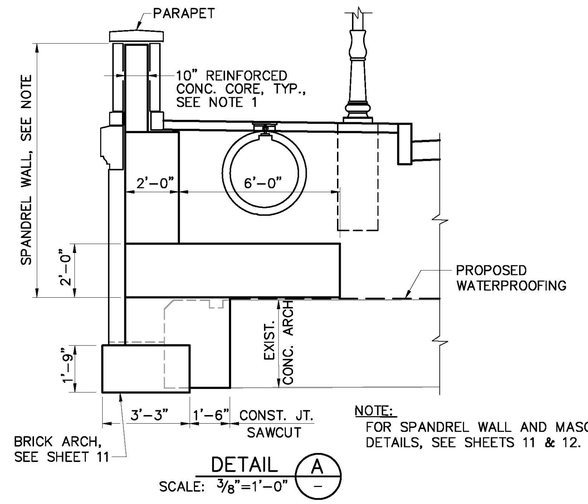
SCALE: 3/16"=1'-0"



PROPOSED CROSS SECTION AT PIER/ABUT.

(SEE INTERMEDIATE CROSS SECTION FOR ADDITIONAL INFORMATION)

SCALE: 3/16"=1'-0"



NOTE:
FOR SPANDREL WALL AND MASONRY DETAILS, SEE SHEETS 11 & 12.

DETAIL A

SCALE: 3/8"=1'-0"

NOTES:

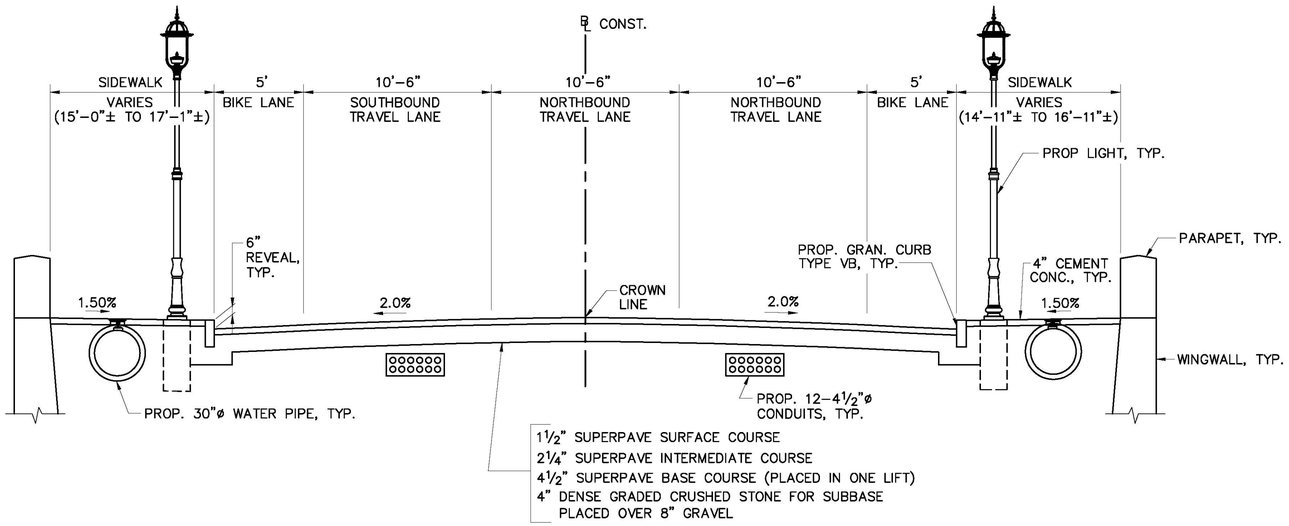
1. USE SIMILAR REINFORCEMENT AS CP-PL2 PARAPET FOR THE REINFORCEMENT OF THE CONCRETE CORE OF THE BRIDGE PARAPET.

DES.	DR.	EST.
BSK	RAT	---
CHK.	CHK.	CHK.
PFH	BSK	---

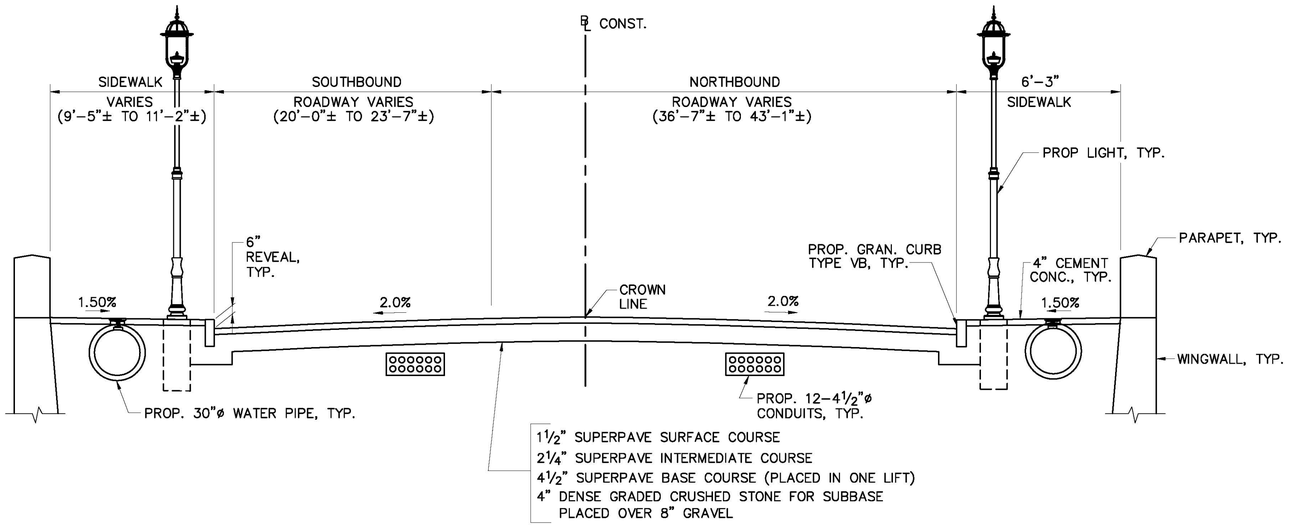
FS & T FILE NO. VQ-061

ENGINEER IN CHARGE

R:\VQ-061 Larz Anderson\03 CADD\Structural\Contract Drawings\25%Submission\ENF ATT 2 DRAWINGS\06-PROP_SECTIONS.dwg 01/13/11 11:31 [47.11] By Goodri_C



NORTH APPROACH SECTION
(LOOKING UP STATION)
SCALE: ¼"=1'–0"

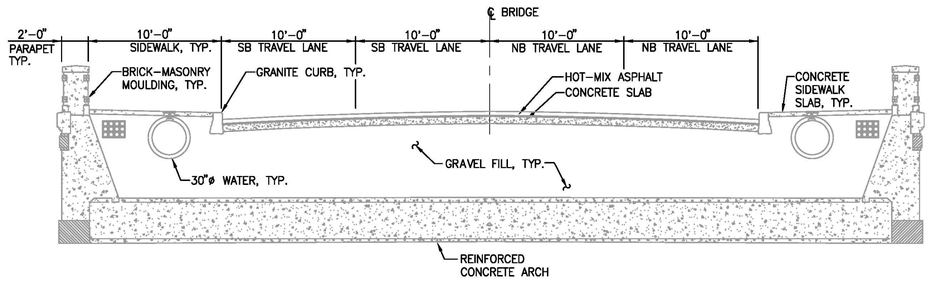


SOUTH APPROACH SECTION
(LOOKING UP STATION)
SCALE: ¼"=1'–0"

DES.	DR.	EST.
BSK	RAT	---
CHK.	CHK.	CHK.
PFH	BSK	---

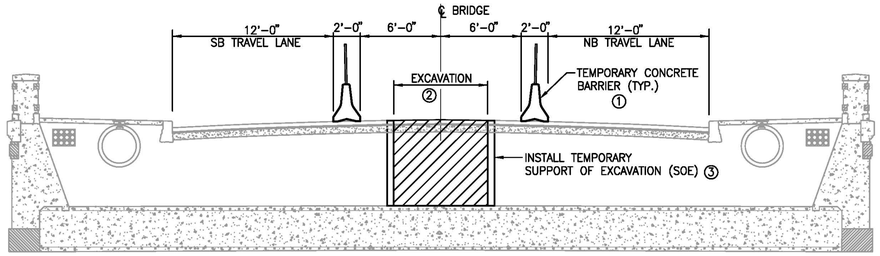
FS & T FILE NO. VQ-061
ENGINEER IN CHARGE

R:\VQ–061 Larz Anderson\03 CADD\Structural\Contract Drawings\25%Submission\ENF ATT 2 DRAWINGS\07–TYP_APPR_SECTIONS.dwg 01/13/11 11:31 [10.73] By Goodri_C



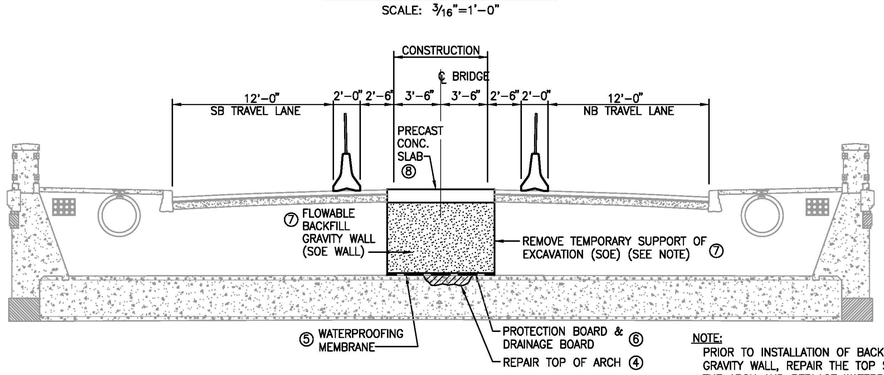
EXISTING INTERMEDIATE SECTION

SCALE: 3/16"=1'–0"



STAGE 1A DEMOLITION

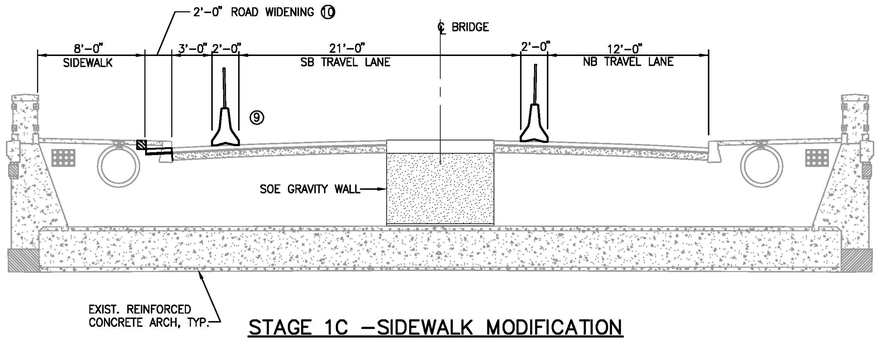
SCALE: 3/16"=1'–0"



NOTE:
PRIOR TO INSTALLATION OF BACKFILL GRAVITY WALL, REPAIR THE TOP SIDE OF THE ARCH AND REPLACE WATERPROOFING MEMBRANE

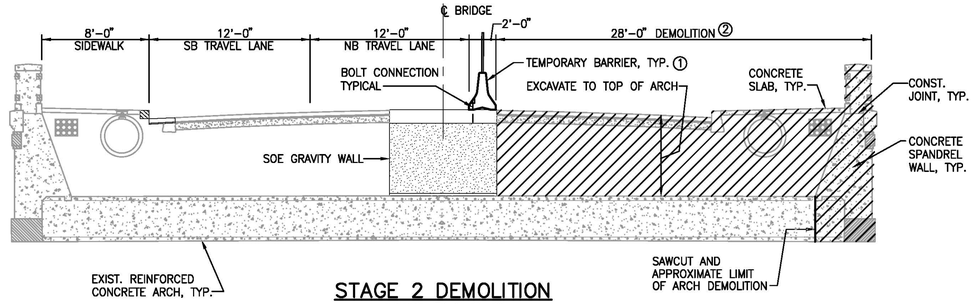
STAGE 1B TEMPORARY EXCAVATION SUPPORT

SCALE: 3/16"=1'–0"



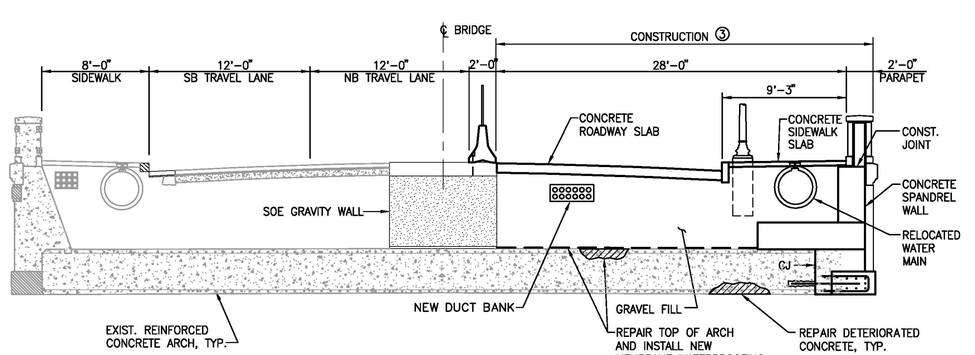
STAGE 1C –SIDEWALK MODIFICATION

SCALE: 3/16"=1'–0"



STAGE 2 DEMOLITION

SCALE: 3/16"=1'–0"



STAGE 2 CONSTRUCTION

SCALE: 3/16"=1'–0"

SEQUENCE OF CONSTRUCTION:

STAGE 1

① INSTALL TEMPORARY CONCRETE TRAFFIC BARRIERS AND SHIFT TRAFFIC
② EXCAVATE TO TOP OF ARCH. USE TRENCH BOX
③ INSTALL TEMPORARY SUPPORT OF EXCAVATION
④ REPAIR TOP SURFACE OF ARCH.
⑤ INSTALL WATERPROOF MEMBRANE
⑥ INSTALL DRAINAGE AND PROTECTION BOARDS
⑦ REMOVE TEMPORARY SOE AND PLACE FLOWABLE BACKFILL
⑧ INSTALL PRECAST DECK SLAB
⑨ SHIFT TRAFFIC
⑩ WIDEN SOUTHBOUND ROADWAY

STAGE 2

① SHIFT TRAFFIC
② PERFORM DEMOLITION
③ REPAIR TOP SURFACE OF ARCH. CONSTRUCT SPANDREL WALL, WATERPROOF, INSTALL UTILITIES, BACKFILL AND PLACE CONCRETE SLAB

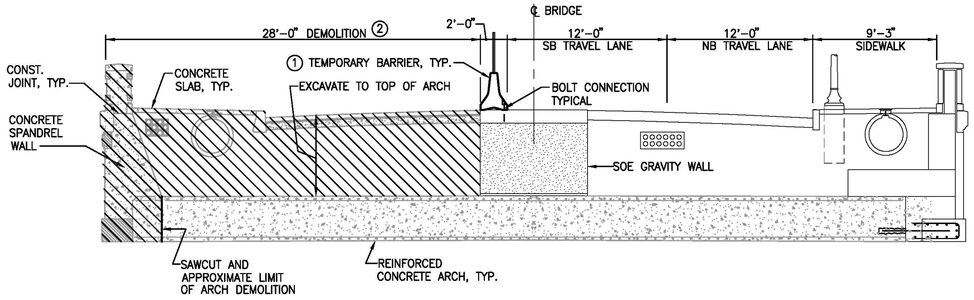
STAGE CONSTRUCTION NOTES:

1. REPAIRS TO THE UNDERSIDE OF THE ARCH SHALL BE DONE ON ONE SPAN AT A TIME. TWO ARCH SPANS SHALL BE OPEN TO NAVIGATION AT ALL TIMES DURING CONSTRUCTION.
2. EXISTING TRANSVERSE REINFORCING STEEL SHALL BE USED IN REPAIR OF THE ARCH.

DES.	DR.	EST.
BSK	RAT	---
CHK.	CHK.	CHK.
PFH	BSK	---

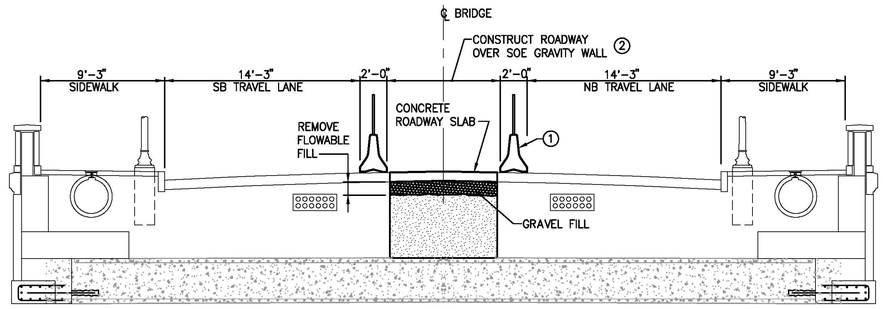
FS & T FILE NO. VQ–061
ENGINEER IN CHARGE

R:\VQ–061 Larz Anderson\03 CADD\Structural\Contract Drawings\25%Submission\ENF ATT 2 DRAWINGS\08–STAGECONST_PART1.dwg 01/13/11 11:32 [11.65] By Goodri_C



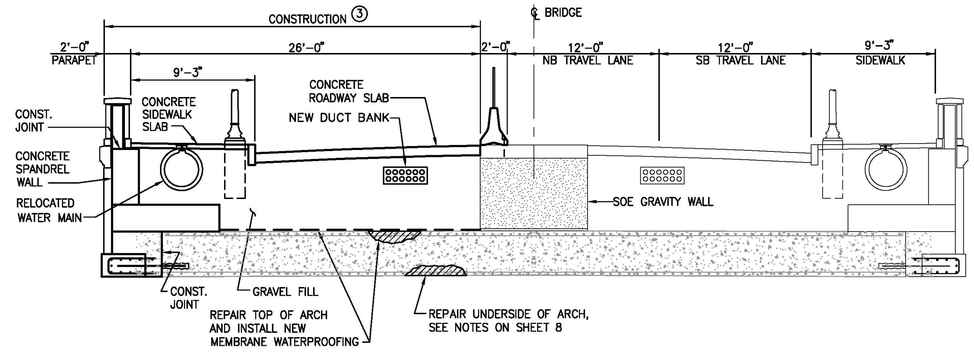
STAGE 3 DEMOLITION

SCALE: 3/16"=1'-0"



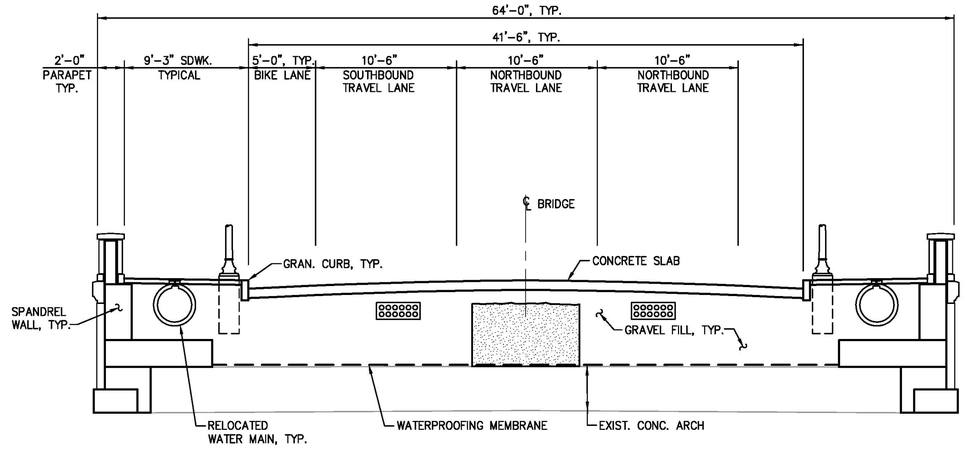
STAGE 4 FINAL CONSTRUCTION

SCALE: 3/16"=1'-0"



STAGE 3 CONSTRUCTION

SCALE: 3/16"=1'-0"



(3) STAGE 4

SCALE: 3/16"=1'-0"

SEQUENCE OF CONSTRUCTION:

STAGE 3

(1) SHIFT TRAFFIC
(2) PERFORM DEMOLITION
(3) REPAIR TOP SURFACE OF ARCH. CONSTRUCT SPANDREL WALL, WATERPROOF, INSTALL UTILITIES, BACKFILL AND PLACE CONCRETE SLAB

STAGE 4

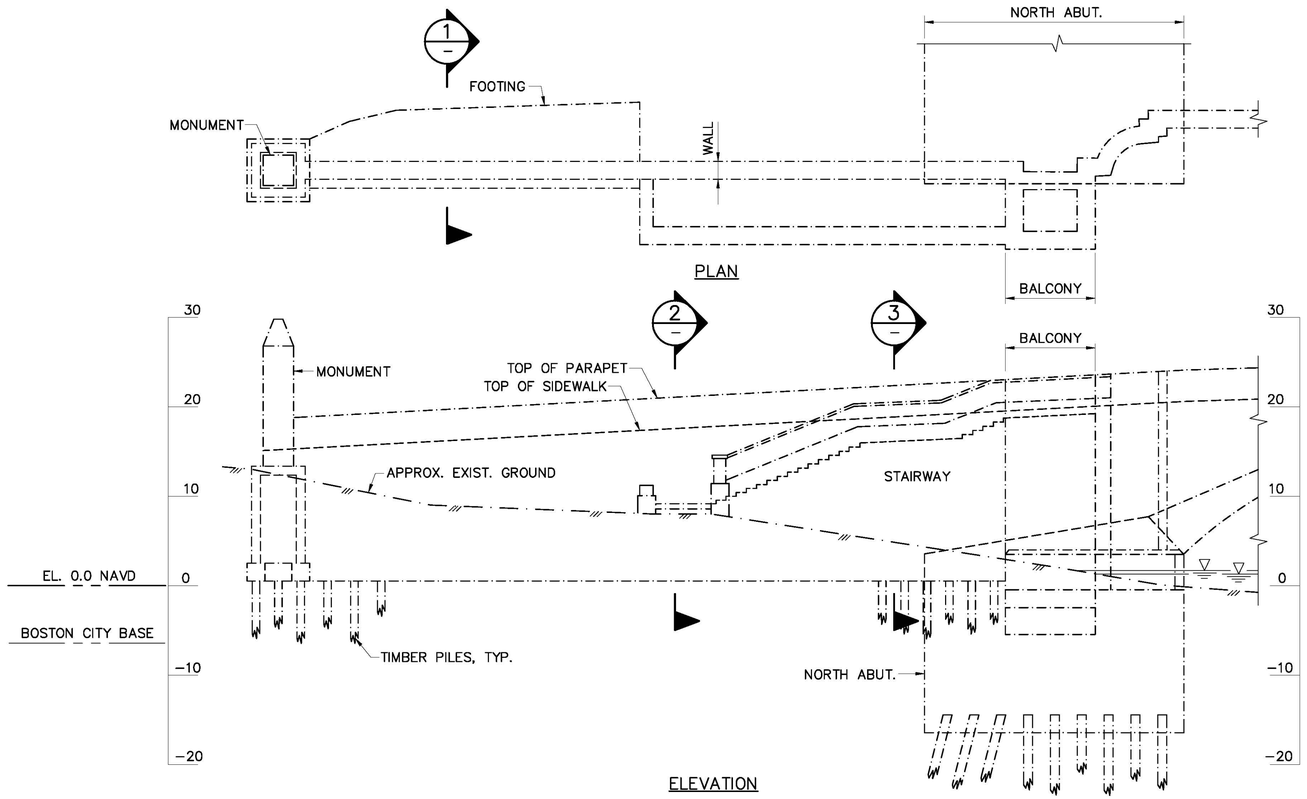
(1) SHIFT TRAFFIC
(2) CONSTRUCT ROADWAY SLAB
(3) FINAL ROADWAY AND FINAL SECTION

NOTES:

1. SEE NOTES ON SHEET 8.

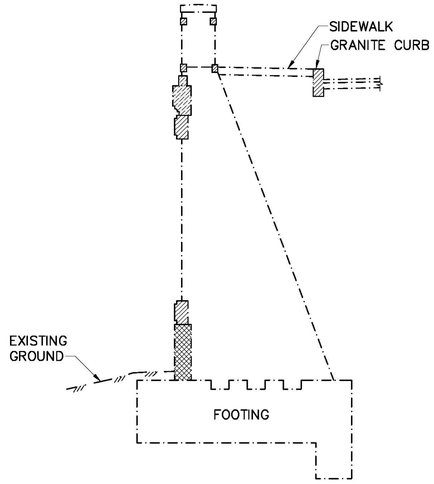
DES.	DR.	EST.
BSK	RAT	---
CHK.	CHK.	CHK.
PFH	BSK	---

FS & T FILE NO. VQ-061 ENGINEER IN CHARGE



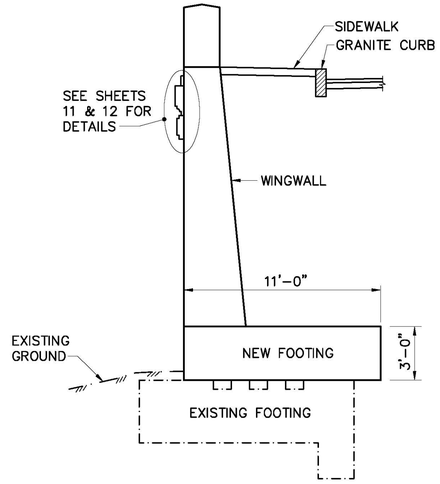
EXISTING NORTHWEST WINGWALL–CAMBRIDGE SIDE

SCALE: 1/8"=1'–0"



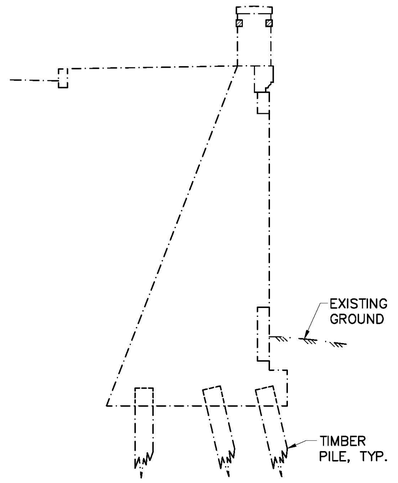
BOSTON SIDE
TYPICAL EXISTING WINGWALL SECTION

SCALE: 1/4"=1'–0"



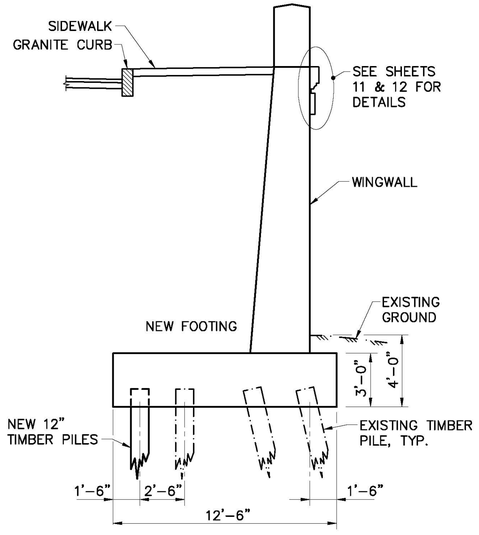
BOSTON SIDE
TYPICAL PROPOSED WINGWALL SECTION

SCALE: 1/4"=1'–0"



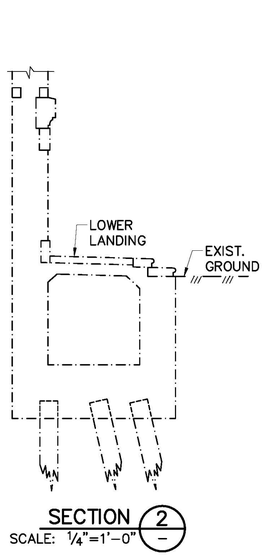
CAMBRIDGE SIDE
EXISTING WINGWALL SECTION (1)

SCALE: 1/4"=1'–0"



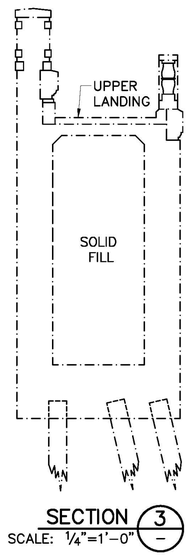
CAMBRIDGE SIDE
TYPICAL PROPOSED WINGWALL SECTION

SCALE: 1/4"=1'–0"



SECTION (2)

SCALE: 1/4"=1'–0"

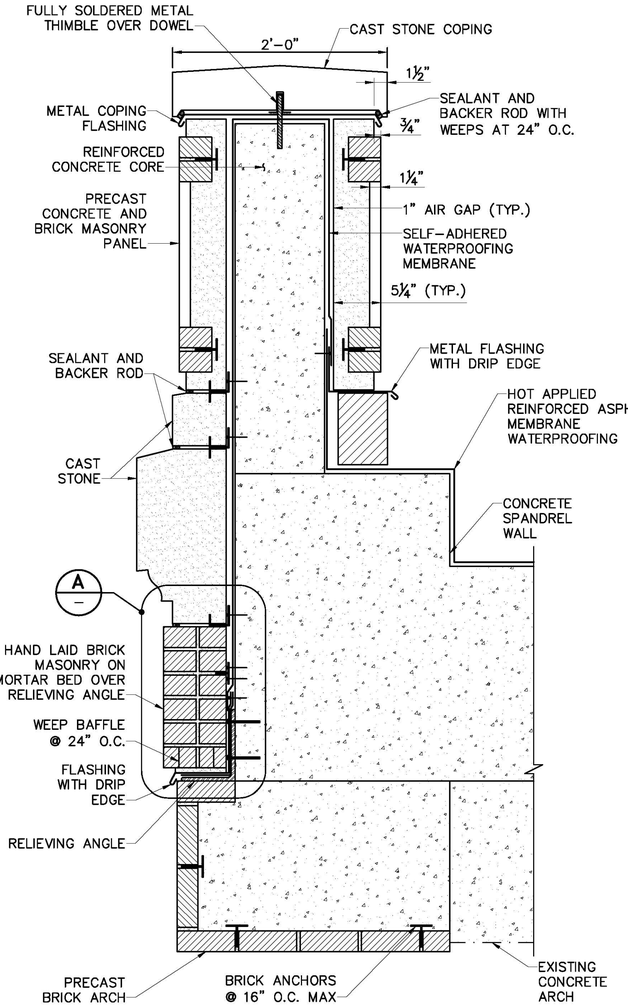


SECTION (3)

SCALE: 1/4"=1'–0"

FS & T FILE NO.	DES.	BSK	PFH
VQ-061	DR.	RAT	CHK.
	EST.	—	CHK.
ENGINEER IN CHARGE			—

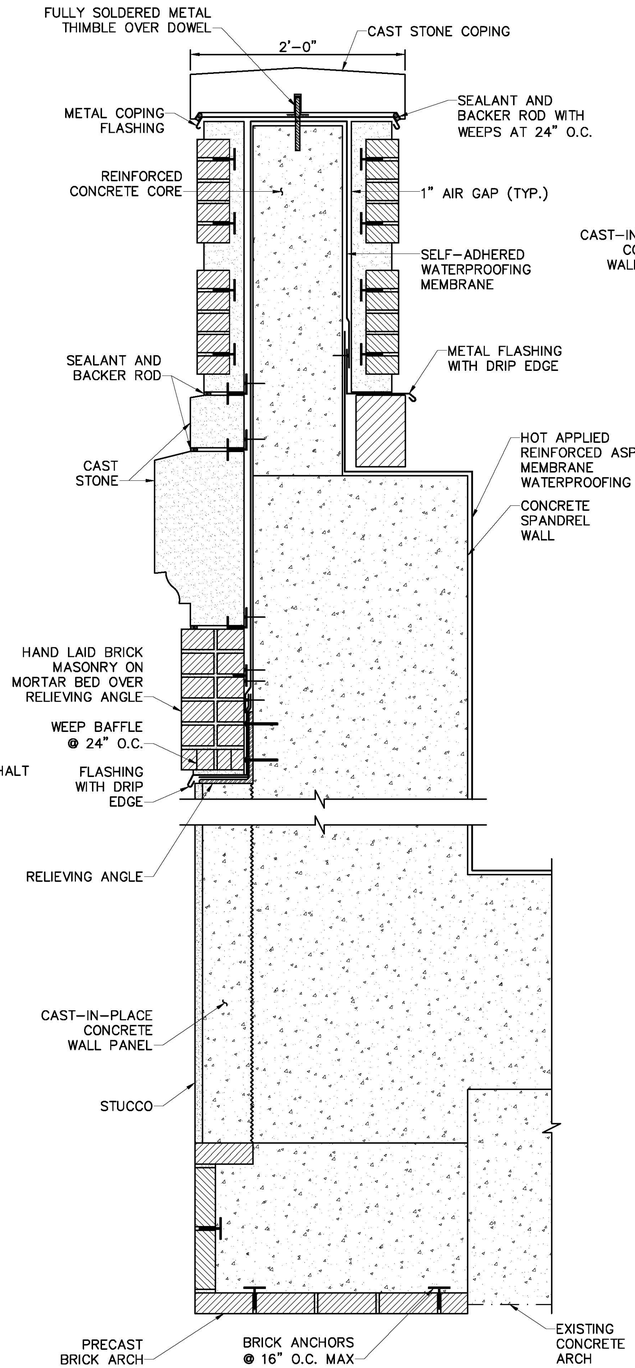
R:\VQ–061 Larz Anderson\03 CADD\Structural\Contract Drawings\25%Submission\ENF ATT 2 DRAWINGS\10–WINGWALL_TYP_SECTIONS.dwg 01/13/11 11:33 [19.04] By Goodri_C



NOTE:

1. CURE ALL BRICK 6 MONTHS BEFORE INSTALLATION.

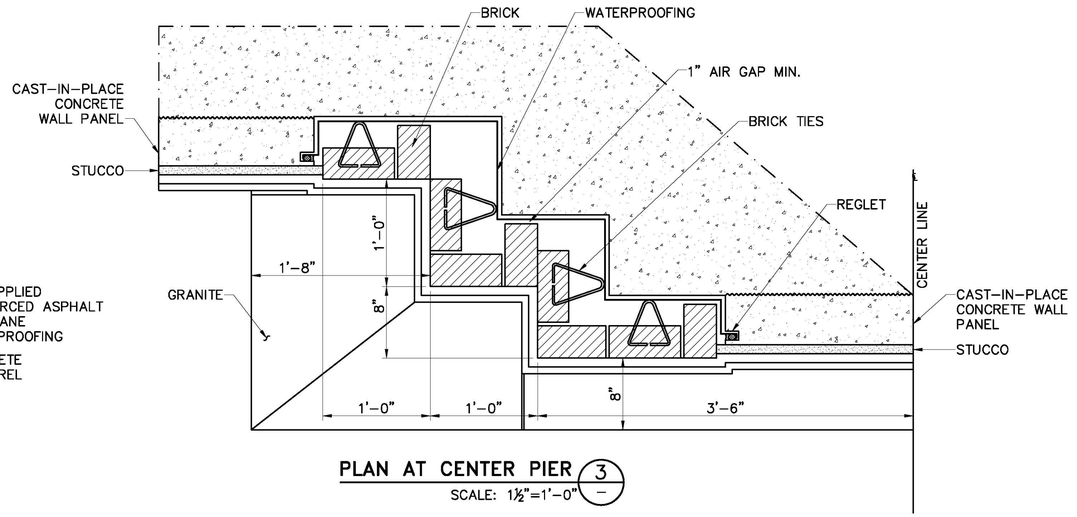
SECTION AT CROWN (1/–)
SCALE: 1½"=1'-0"



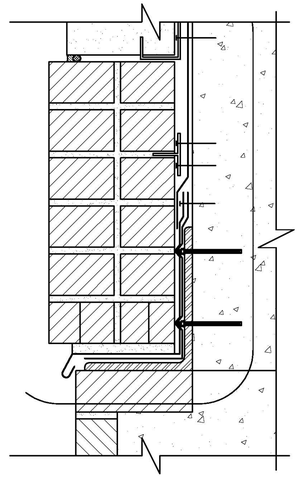
NOTE:

1. CURE ALL BRICK 6 MONTHS BEFORE INSTALLATION.

SECTION THROUGH ARCH (2/–)
SCALE: 1½"=1'-0"



PLAN AT CENTER PIER (3/–)
SCALE: 1½"=1'-0"

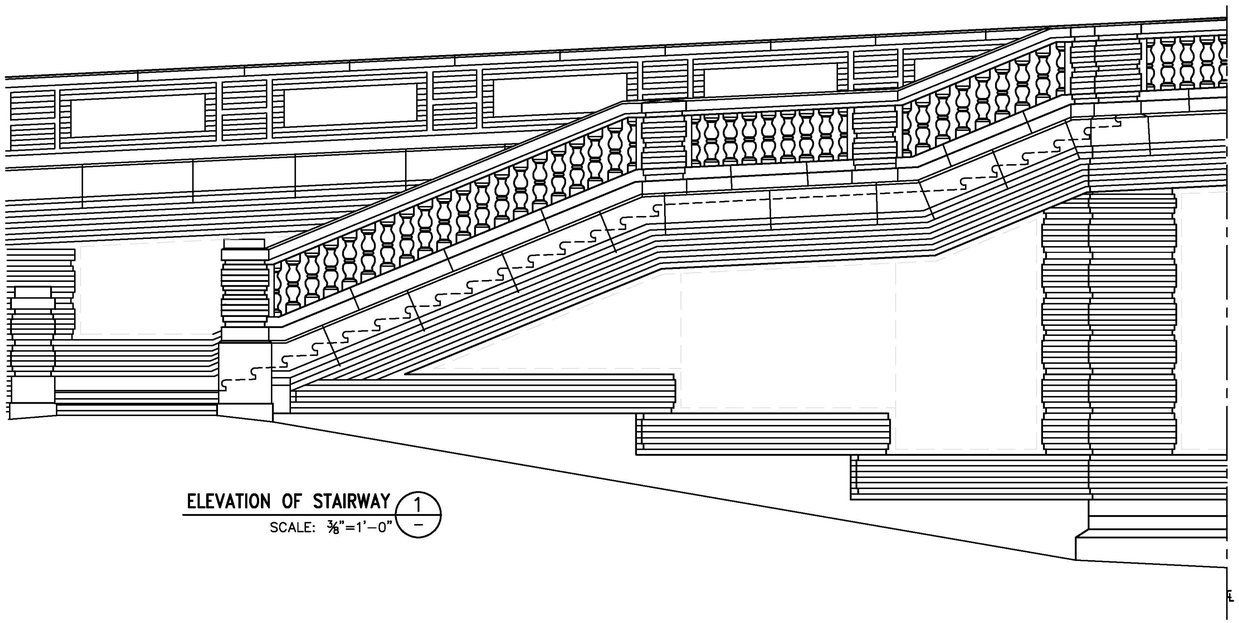


DETAIL (A/–)
SCALE: 3"=1'-0"

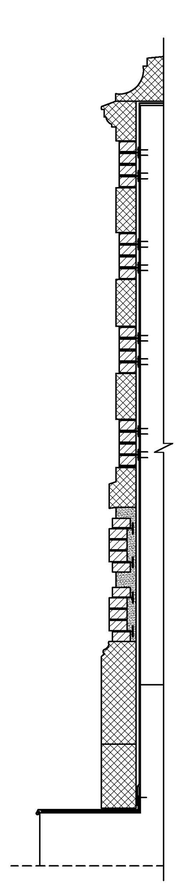
DES.	DR.	EST.
CHK.	CHK.	CHK.

FS & T FILE NO. VQ-061 ENGINEER IN CHARGE

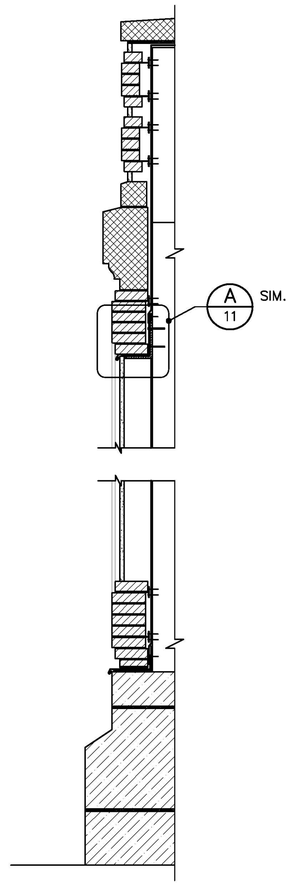
R:\VQ-061 Larz Anderson\03 CADD\Structural\Contract Drawings\25%Submission\ENF ATT 2 DRAWINGS\11-ARCH_DET_PART1.dwg 01/13/11 11:34 [15.91] By Goodri_C



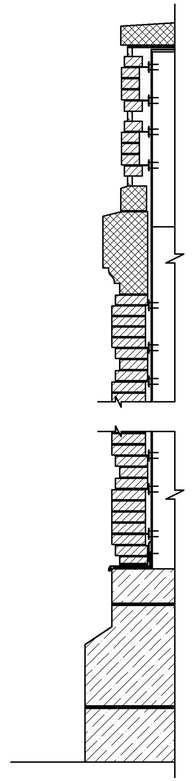
ELEVATION OF STAIRWAY (1)
SCALE: 3/8"=1'-0"



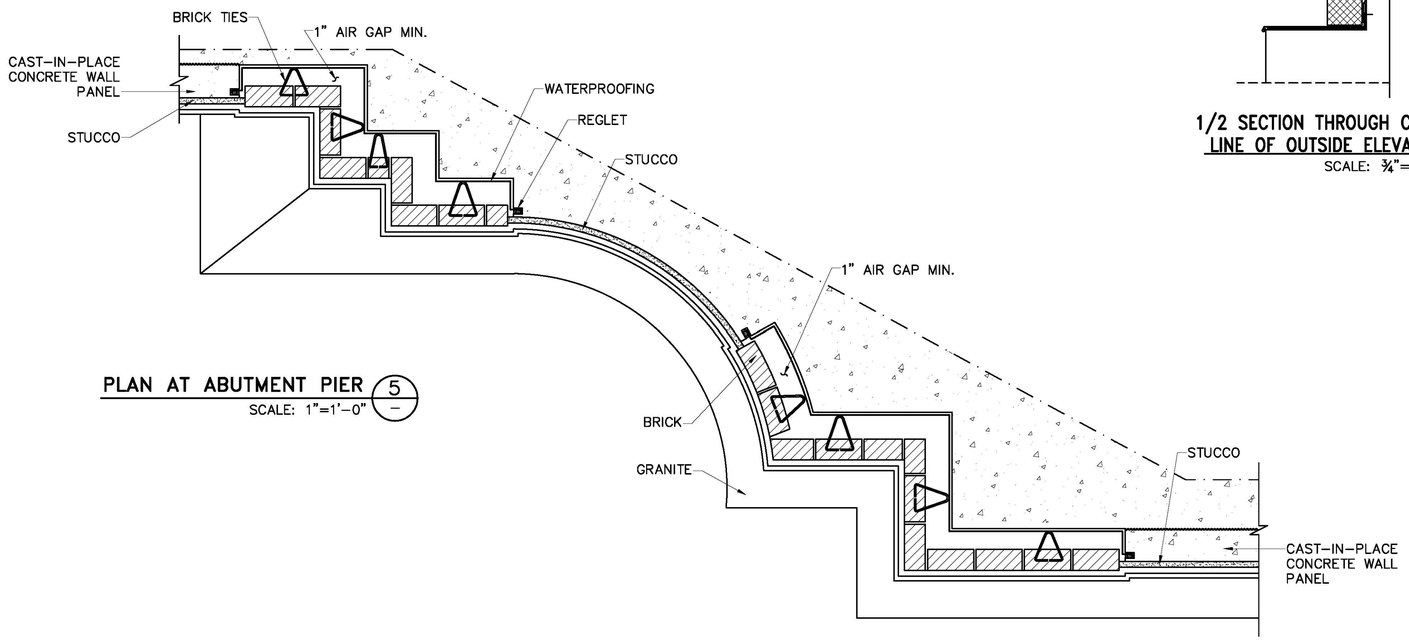
1/2 SECTION THROUGH CENTER LINE OF OUTSIDE ELEVATION (2)
SCALE: 3/4"=1'-0"



CENTER PIER SECTION (3)
SCALE: 3/4"=1'-0"



ABUTMENT PIER SECTION (4)
SCALE: 3/4"=1'-0"



PLAN AT ABUTMENT PIER (5)
SCALE: 1"=1'-0"

CHK.	CHK.	CHK.
DES.	DR.	EST.

FS & T FILE NO. VQ-061 ENGINEER IN CHARGE

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		1	157
PROJECT FILE NO. 605517			

TITLE SHEET & INDEX

PLAN AND PROFILE OF

REHABILITATION OF THE ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011 = C-01-007
NORTH HARVARD STREET OVER CHARLES RIVER

IN THE CITY OF **BOSTON** SUFFOLK COUNTY

IN THE CITY OF **CAMBRIDGE** MIDDLESEX COUNTY

FEDERAL AID PROJECT NO.

THE MASSACHUSETTS HIGHWAY DEPARTMENT 1988 STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES; THE SUPPLEMENTAL SPECIFICATIONS DATED FEBRUARY 25, 2010; THE STANDARD SPECIAL PROVISIONS DATED APRIL 23, 2010; THE 2010 CONSTRUCTION STANDARD DETAILS; THE CURRENT EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" WITH LATEST REVISIONS; THE 1990 "STANDARD DRAWINGS FOR SIGNS AND SUPPORTS"; THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING; AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK WILL GOVERN.

INDEX

CONVENTIONAL SIGNS

COUNTY, CITY, OR TOWN BOUNDARY

COUNTY, CITY, OR TOWN SIDE LINE

FENCE LINE

BASE LINE OR SURVEY LINE — S36°04'20"W 53.578 — 2+00

RIGHT OF WAY LINE

CULVERT

RETAINING WALL

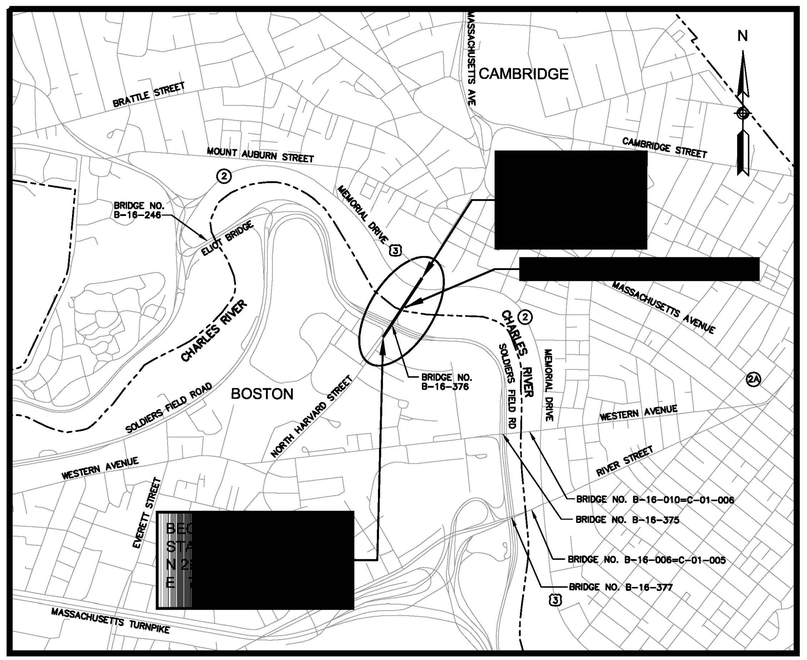
GUARD RAIL

STONE WALL

TREE LINE

POLE

ELEVATIONS — PROPOSED SURFACE / PRESENT SURFACE — PRES. 90.7 — PROP. 90.91 — 10+20



1000 0 1000 2000

SCALE 1" = 1000'

LENGTH OF PROJECT = 1,100.00 FEET = 0.21 MILES

DESIGN DESIGNATION

DESIGN SPEED	30 mph
ADT (2014)	21,300
ADT (2034)	24,300
K	8.0%
D	60.0%
T (PEAK HOUR)	3.0%
T (AVERAGE DAY)	3.0%
DHV	1,900
DDHV	1,140
FUNTIONAL CLASS	URBAN MINOR ARTERIAL

ENVIRONMENTAL NOTIFICATION FORM

FS&T DWG. NO.			
VQ-061			
DES	AED	CHK	JMM
DR	AED	CHK	JMM
EST	PGM	CHK	JMM
ENGINEER IN CHARGE			

ENGINEERS
FST Since 1914
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

RECOMMENDED FOR APPROVAL

CHIEF ENGINEER DATE

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
APPROVED:

DIVISION ADMINISTRATOR DATE

APPROVED

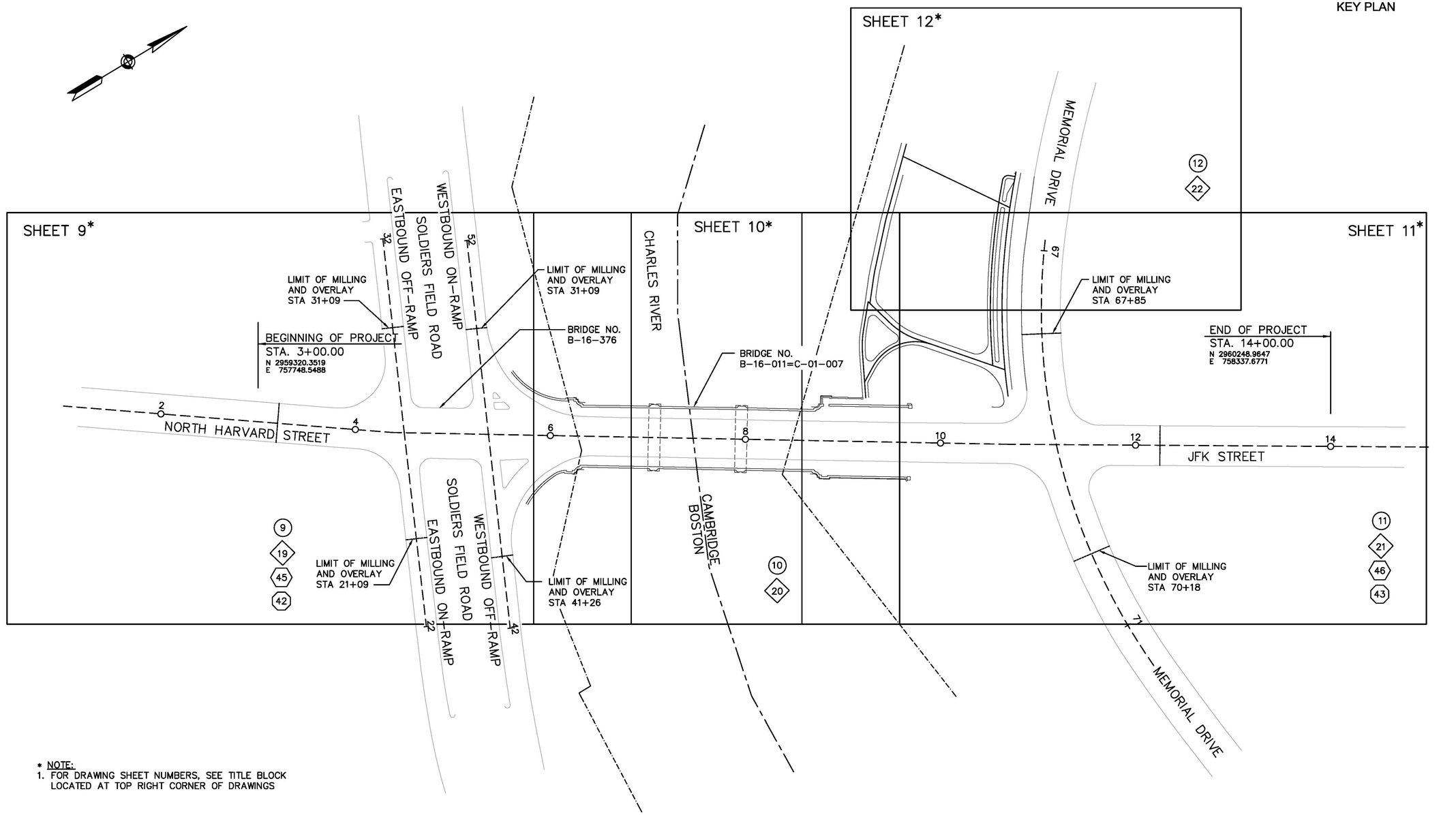
DIVISION ADMINISTRATOR DATE

[Michal_J] - January 13, 2011 - 11:50am - R:\VQ-061 Larz Anderson\05 Civil\Drawings\ENF\2011-01-13 Rev2-ENF\ENF-Titlesh.dwg [Layout1]

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		4	157
PROJECT FILE NO. 605517			

KEY PLAN



* NOTE:
1. FOR DRAWING SHEET NUMBERS, SEE TITLE BLOCK LOCATED AT TOP RIGHT CORNER OF DRAWINGS

50 0 50 100
SCALE IN FEET

LEGEND

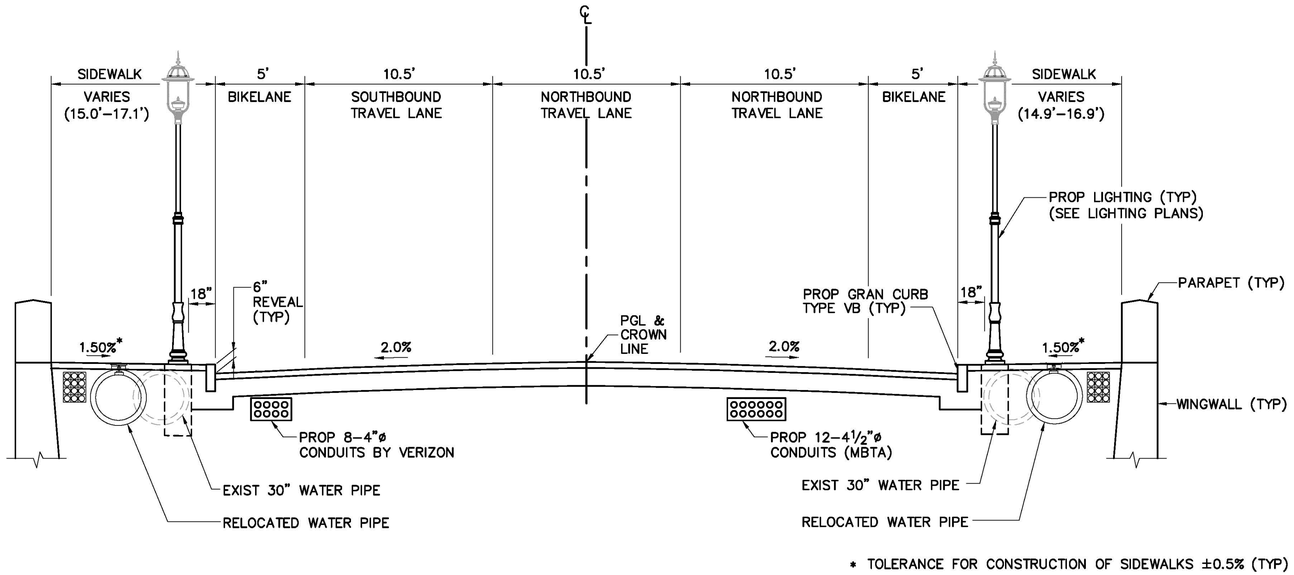
SHEET NO → 9 CONSTRUCTION PLAN
15 GRADING AND TIE PLAN
46 UTILITY PLANS
43 STREET LIGHTING PLANS

FS&T DWG. NO.			
VQ-061			
DES	AED	CHK	JMM
DR	AED	CHK	JMM
EST	PGM	CHK	JMM
ENGINEER IN CHARGE			

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

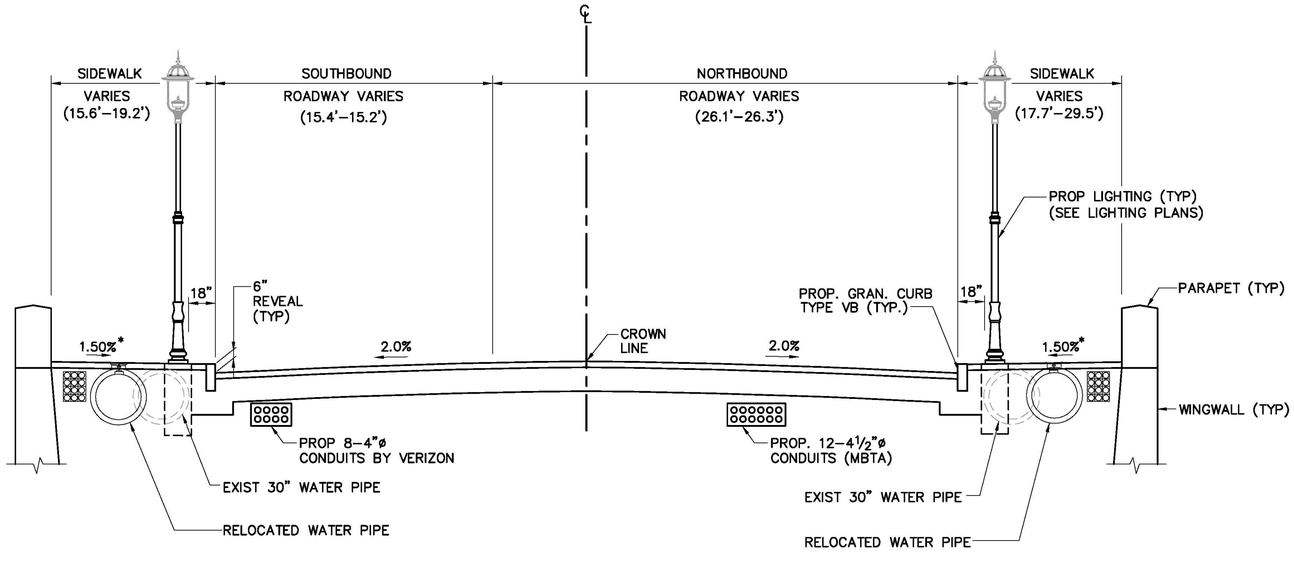
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		5	157
PROJECT FILE NO. 605517			

TYPICAL SECTIONS
SHEET 1 OF 4



* TOLERANCE FOR CONSTRUCTION OF SIDEWALKS ±0.5% (TYP)

NORTH APPROACH SECTION – JFK STREET, CAMBRIDGE
(STA 8+96± TO STA 10+57±)
(LOOKING UP STATION)



* TOLERANCE FOR CONSTRUCTION OF SIDEWALKS ±0.5% (TYP)

SOUTH APPROACH SECTION – NORTH HARVARD STREET, BOSTON
(STA 5+96± TO STA 6+06±)
(LOOKING UP STATION)

0 4 10 20
SCALE IN FEET

PAVEMENT NOTES:

PAVEMENT MILLING & OVERLAY:

SURFACE: MILL 2" EXISTING PAVEMENT

2" SUPERPAVE SURFACE COURSE
BITUMEN FOR TACK COAT (RS–1 EMULSION)
– APPLIED AT 0.07 GAL/SY OVER MILLED SURFACES

FULL DEPTH PAVEMENT:

SURFACE: 1½" SUPERPAVE SURFACE COURSE

INTERMEDIATE: 2¼" SUPERPAVE INTERMEDIATE COURSE

BITUMEN FOR TACK COAT (RS–1 EMULSION)
– APPLIED AT 0.05 GAL/SY OVER BINDER AND BASE COURSE

BASE: 4½" SUPERPAVE BASE COURSE (PLACED IN ONE LIFT)

SUBBASE: 4" DENSE GRADED CRUSHED STONE FOR SUBBASE
PLACED OVER 8" GRAVEL – TYPE b (MIN)

CEMENT CONCRETE SIDEWALKS:

SURFACE: 4" CEMENT CONCRETE (6" AT WHEELCHAIR RAMPS)

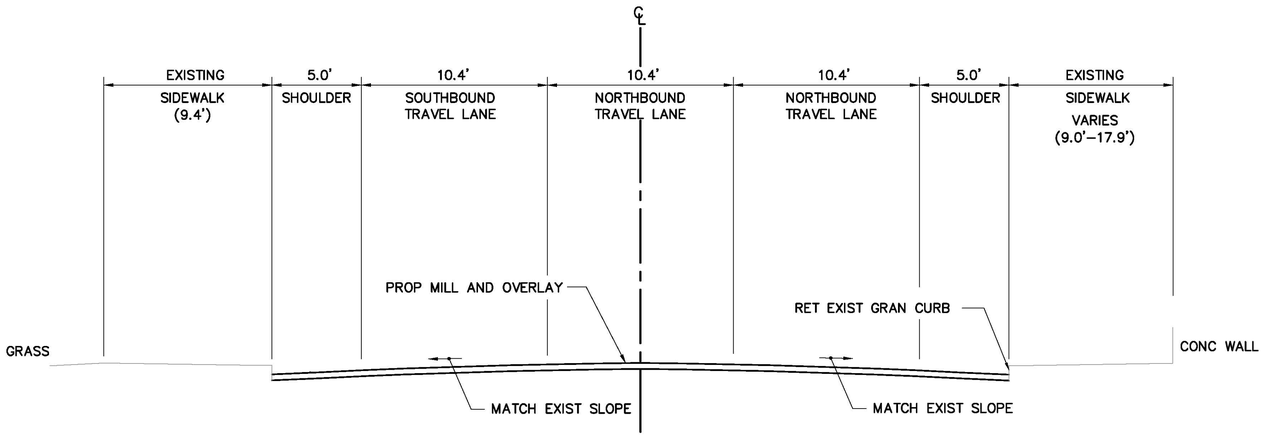
FOUNDATION: 8" GRAVEL BORROW – TYPE b (MIN)

FS&T DWG. NO.			
VQ-061			
DES	AED	CHK	JMM
DR	AED	CHK	JMM
EST	PGM	CHK	JMM
ENGINEER IN CHARGE			

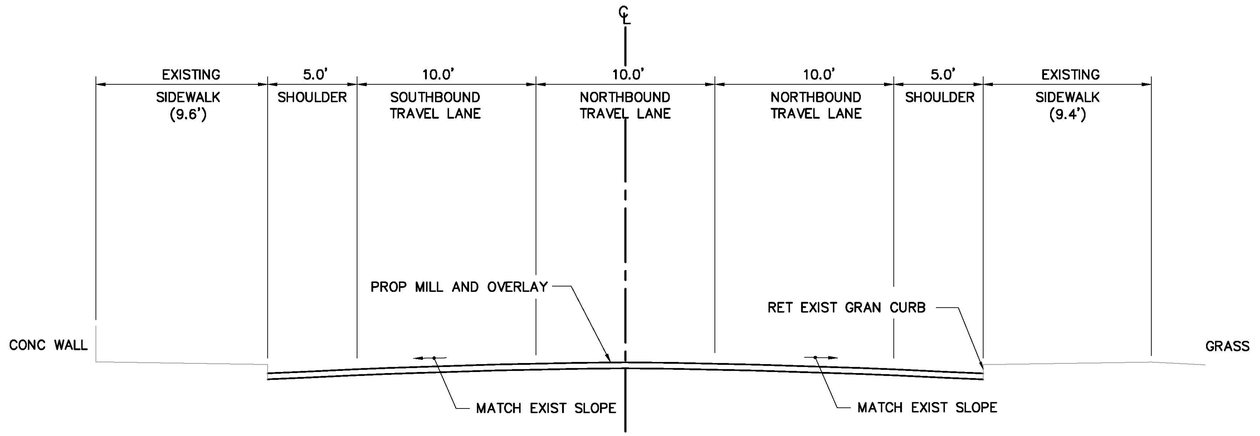
BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		6	157
PROJECT FILE NO. 605517			

TYPICAL SECTIONS
SHEET 2 OF 4



NORTH APPROACH SECTION – JFK STREET, CAMBRIDGE
(STA 11+75± TO STA 14+00)
(LOOKING UP STATION)



SOUTH APPROACH SECTION – NORTH HARVARD STREET, BOSTON
(STA 3+00 TO STA 3+75±)
(LOOKING UP STATION)

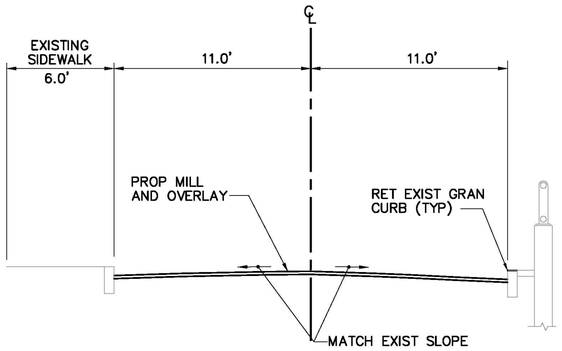
0 4 10 20
SCALE IN FEET

FS&T DWG. NO.			
VQ-061			
DES	AED	CHK	JMM
DR	AED	CHK	JMM
EST	PGM	CHK	JMM
ENGINEER IN CHARGE			

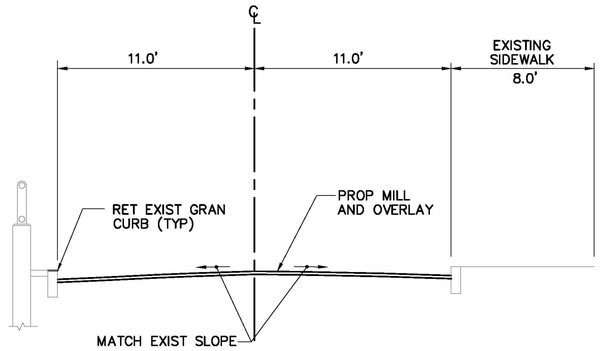
BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		7	157
PROJECT FILE NO. 605517			

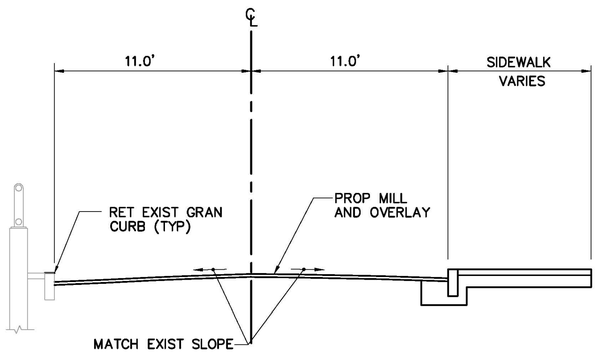
TYPICAL SECTIONS
SHEET 3 OF 4



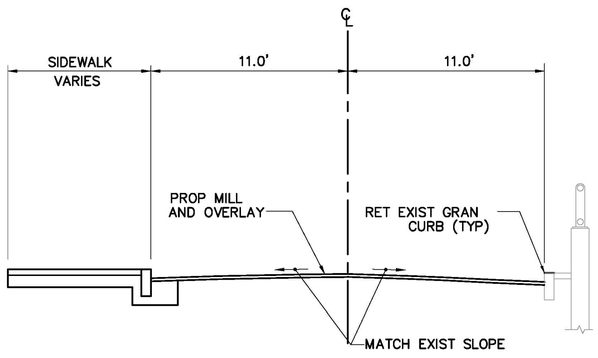
SOLDIERS FIELD ROAD
EASTBOUND OFF–RAMP
(STA 30+85± TO STA 31+09±)
(LOOKING UP STATION)



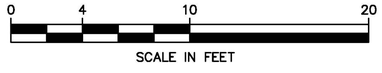
SOLDIERS FIELD ROAD
EASTBOUND ON–RAMP
(STA 20+62± TO STA 21+09±)
(LOOKING UP STATION)



SOLDIERS FIELD ROAD
WESTBOUND ON–RAMP
(STA 50+38± TO STA 51+09±)
(LOOKING UP STATION)



SOLDIERS FIELD ROAD
WESTBOUND OFF–RAMP
(STA 40+36± TO STA 41+26±)
(LOOKING UP STATION)

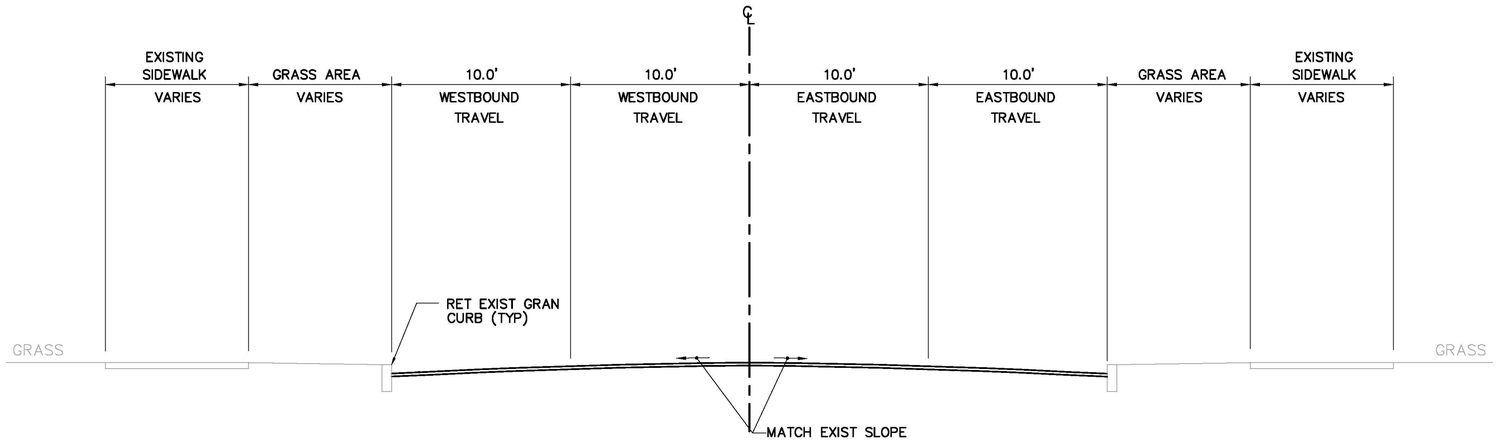


F&T DWG. NO.			
VQ-061			
DES	AED	CHK	JMM
DR	AED	CHK	JMM
EST	PGM	CHK	JMM
ENGINEER IN CHARGE			

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		8	157
PROJECT FILE NO. 605517			

TYPICAL SECTIONS
SHEET 4 OF 4



MEMORIAL DRIVE
(STA 67+85± TO STA 68+34±)
(STA 69+65± TO STA 70+18±)
(LOOKING UP STATION)

0 4 10 20
SCALE IN FEET

F&T DWG. NO.			
VQ-061			
DES	AED	CHK	JMM
DR	AED	CHK	JMM
EST	PGM	CHK	JMM
ENGINEER IN CHARGE			

STEEL BEAM HWY. GUARD
NONE

TRAFFIC SIGNAL
SEE SHEET NO. 30

WATER SUPPLY ALTERATIONS
SEE SHEET NO. 59 & 60

DRAINAGE DETAILS
SEE SHEET NO. 59 & 60

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		9	157
PROJECT FILE NO. 605517			

CONSTRUCTION PLAN
SHEET 1 OF 4

BEGINNING OF PROJECT
STA. 3+00.00
MEET EXISTING PAVEMENT MARKINGS
N 2959320.3519
E 757748.5488

STA 4+50.20 N HARVARD ST ℄ = STA 30+00.00 SOLDIERS FIELD RD EASTBOUND OFF-RAMP ℄

STA 4+50.20 N HARVARD ST ℄ = STA 20+00.00 SOLDIERS FIELD RD EASTBOUND ON-RAMP ℄

STA 5+36.58 N HARVARD ST ℄ = STA 50+00.00 SOLDIERS FIELD RD WESTBOUND ON-RAMP ℄

STA 5+36.58 N HARVARD ST ℄ = STA 40+00.00 SOLDIERS FIELD RD WESTBOUND OFF-RAMP ℄

NORTH HARVARD STREET

SOLDIERS FIELD ROAD

EASTBOUND OFF-RAMP

EASTBOUND ON-RAMP

WESTBOUND ON-RAMP

WESTBOUND OFF-RAMP

CONST ℄

N35°40'23"E 337.81'

N32°10'19"E 628.90'

N65°12'06"W

N65°15'55"W

S65°26'58"E

S65°19'16"E

LIMIT OF MILLING AND OVERLAY STA. 3+20

LIMIT OF MILLING AND OVERLAY STA 31+09

LIMIT OF MILLING AND OVERLAY STA 51+09

LIMIT OF MILLING AND OVERLAY STA 21+09

LIMIT OF MILLING AND OVERLAY STA 41+26

LIMIT OF WORK

LIMIT OF FULL DEPTH CONSTRUCTION

SAWCUT

SAWCUT BIT CONC WALK

SAWCUT CONC WALK

PROP TEMPORARY EASEMENT

PROP CEM CONC SIDEWALK

PROP CEM CONC SIDEWALK (TYP)

PROP GRANITE CURB

RESET STONE MONUMENT

REM EXIST TREE

REM EXIST TREES

REM EXIST GRAN CURB

REM EXIST GRAN. CURB

REM EXIST GRAN CURB & SIDEWALK

REM F&G. PROP F&C

PROP MILL AND OVERLAY

PROP GRANITE CURB

PROP CBCI

PROP SHLO

PROP FILTER TUBES

APPROX BLSF (ELEV=4.0')

25 FT RFA

100 FT BUFFER TO BANK

SEE BRIDGE PLANS

SB/DH FND SEE DETAIL "D"

SB/DH FND

DH HELD N 2959399.98 E 757861.67

MATCHLINE

CONT. ON SHEET NO. 10

FOR PROFILE SEE SHEET 13

20 0 20 40
SCALE IN FEET

FS&T DWG. NO.	
VQ-061	
DES PGM	CHK JMM
DR PGM	CHK JMM
EST PGM	CHK JMM
ENGINEER IN CHARGE	

[Michal_J] - January 13, 2011 - 12:49pm - R:\VQ-061 Larz Anderson\05 Civil\Drawings\ENF\2011-01-13 Rev2-ENF\ENF-Const_Plans.dwg [Sheet 1]

STEEL BEAM HWY. GUARD
NONE

TRAFFIC SIGNAL
NONE

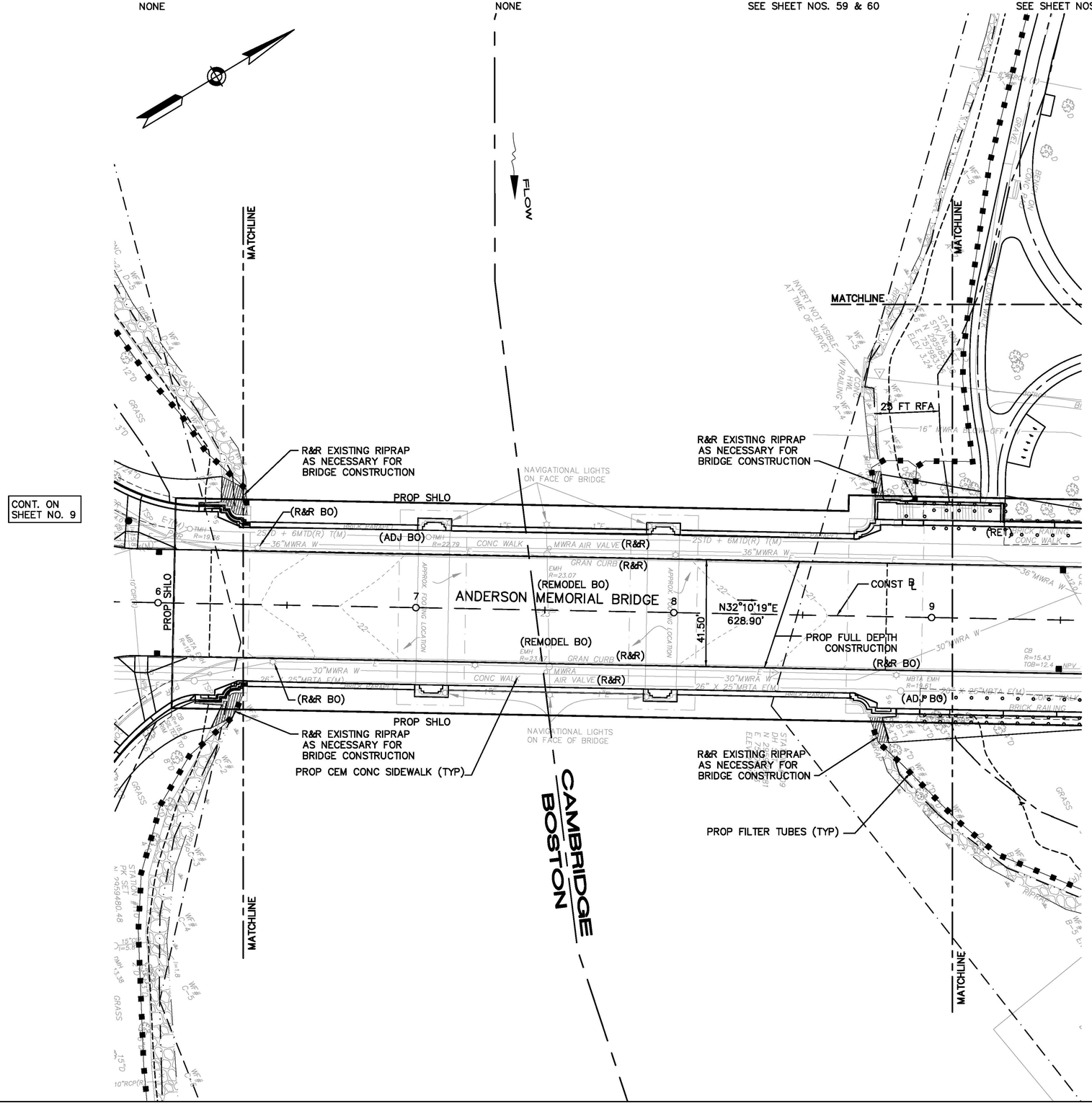
WATER SUPPLY ALTERATIONS
SEE SHEET NOS. 59 & 60

DRAINAGE DETAILS
SEE SHEET NOS. 59 & 60

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		10	157
PROJECT FILE NO. 605517			

CONSTRUCTION PLAN
SHEET 2 OF 4



20 0 20 40
SCALE IN FEET

FOR PROFILE SEE SHEET 14

FS&T DWG. NO.			
VQ-061			
DES	PGM	CHK	JMM
DR	PGM	CHK	JMM
EST	PGM	CHK	JMM
ENGINEER IN CHARGE			

STEEL BEAM HWY. GUARD
NONE

TRAFFIC SIGNAL
SEE SHEET NO. 32

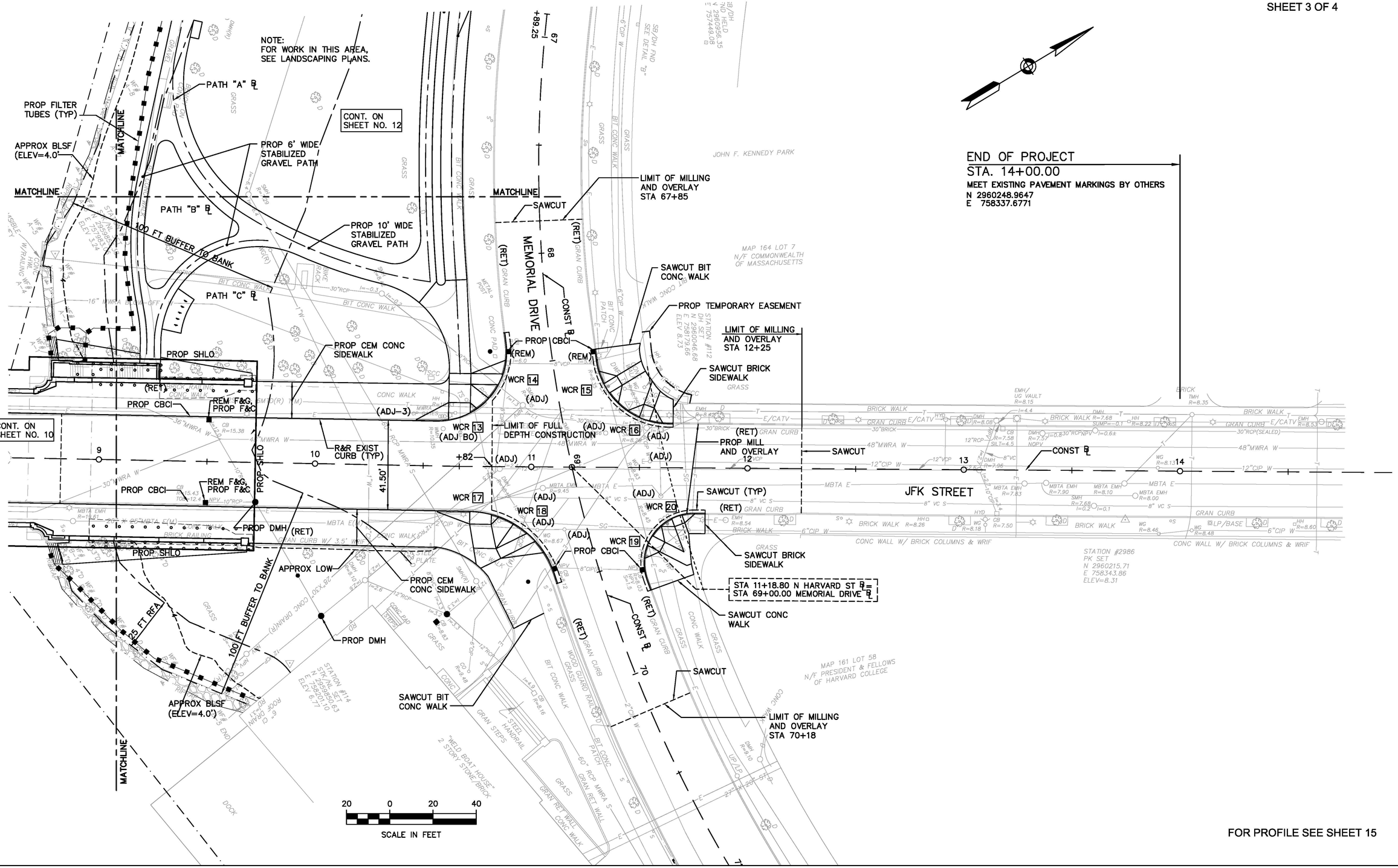
WATER SUPPLY ALTERATIONS
SEE SHEET NO. 59 & 60

DRAINAGE DETAILS
SEE SHEET NO. 59 & 60

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		11	157
PROJECT FILE NO. 605517			

CONSTRUCTION PLAN
SHEET 3 OF 4



FS&T DWG. NO.	
VQ-061	
DES PGM	CHK JMM
DR PGM	CHK JMM
EST PGM	CHK JMM
ENGINEER IN CHARGE	

STEEL BEAM HWY. GUARD
NONE

TRAFFIC SIGNAL
NONE

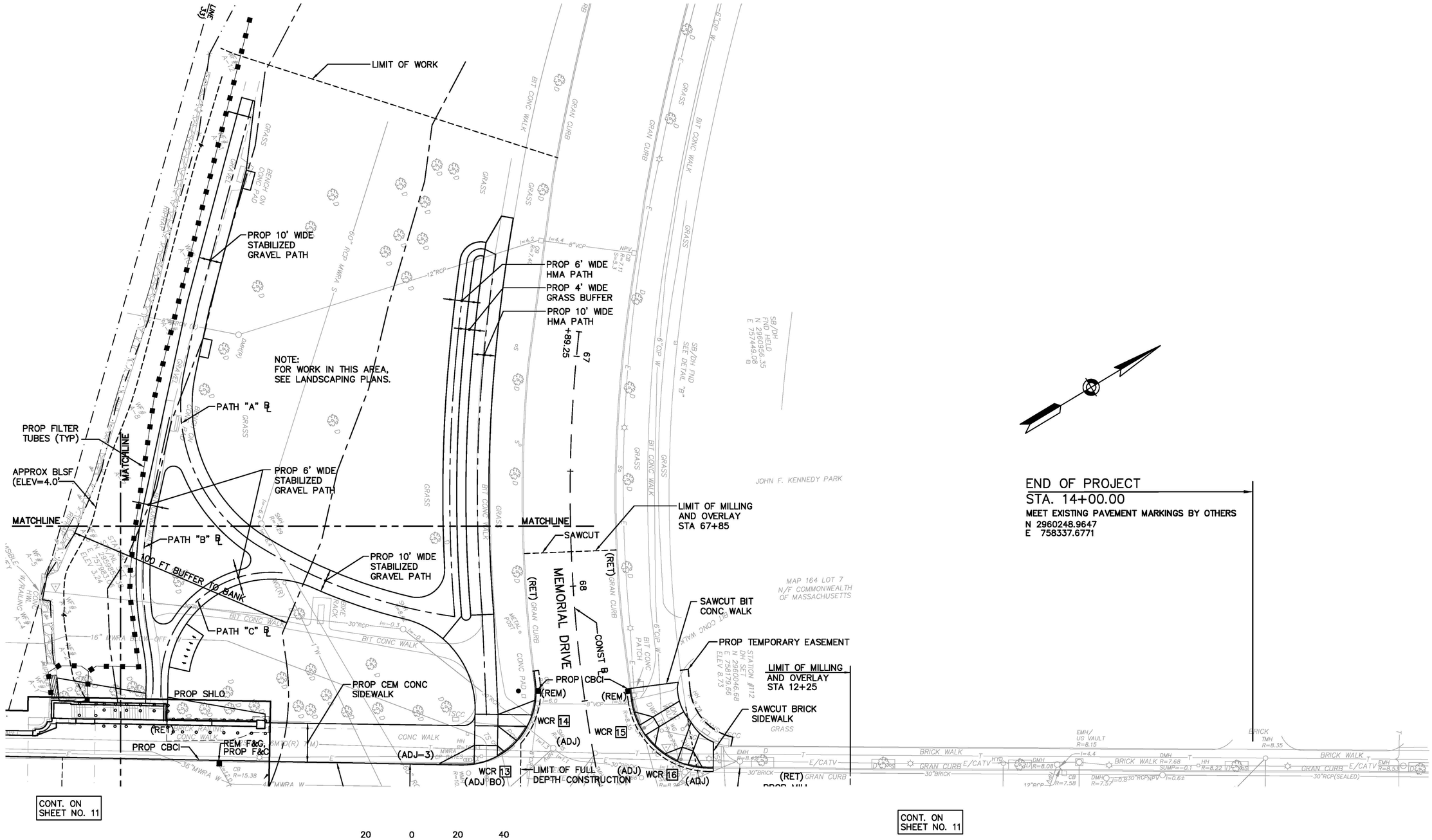
WATER SUPPLY ALTERATIONS
SEE SHEET NO. 45 & 46

DRAINAGE DETAILS
SEE SHEET NO. 45 & 46

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.		12	157
PROJECT FILE NO. 605517			

CONSTRUCTION PLAN
SHEET 4 OF 4



FOR PROFILE SEE SHEET 13

FS&T DWG. NO.	
VQ-061	
DES PGM	CHK JMM
DR PGM	CHK JMM
EST PGM	CHK JMM
ENGINEER IN CHARGE	

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.			
PROJECT FILE NO. 605517			

SITE PREPARATION AND REMOVALS PLAN (CAMBRIDGE SIDE)
L1
75% SUBMITTAL 12/03/10

R&S BENCH
R&D CONCRETE PAD

R&D BIKE RACK
& CONCRETE PAD

APPROXIMATE 100' WETLAND BUFFER

R&S BENCH
R+D CONCRETE PAD

NOMINAL LANDSCAPE
LIMIT OF WORK LINE

REFER TO ENGINEERING
DRAWINGS FOR RIPRAP STONE

REFER TO ENGINEERING &
HISTORIC ARCHITECTURAL
PLANS FOR ALL REMOVALS,
SALVAGE AND DEMOLITION OF
BRIDGE STRUCTURE,
ASSOCIATED PAVING AND
FURNISHINGS

R&D BITUMINOUS
CONCRETE PAVING
AND BASE MATERIAL

P&P CURB

TEMPORARY STRUCTURE
PROTECTION: P&P METAL
FENCE & GRANITE CURB

P&P BOATHOUSE, STEPS, CURB

WELD BOATHOUSE

REFER TO ENGINEERING
PLANS FOR BRIDGE AND
SIDEWALK REMOVALS

NOMINAL LANDSCAPE
LIMIT OF WORK LINE

REFER TO ENGINEERING
DRAWINGS FOR RIPRAP STONE

CONTINUED ON
DWG. L2

MEMORIAL DRIVE

JFK STREET

ANDERSON MEMORIAL BRIDGE

CHARLES RIVER

JOHN F. KENNEDY PARK

MAP 164 LOT 7
N/F COMMONWEALTH
OF MASSACHUSETTS

MAP 161 LOT 58
N/F PRESIDENT & FELLOWS
OF HARVARD COLLEGE

STATION #113
STK/NL SET
N 2959855.38
E 757983.06
ELEV 3.24

STATION #114
STK/NL SET
N 2959850.63
E 758291.67
ELEV 6.7

STATION #112
DH SET
N 2960046.68
E 755979.66
ELEV 8.73

APPROXIMATE U.S. HARBOR LINE
(SEE REFERENCE NO'S. 27 & 33)

FLOW

20 0 20 40
SCALE IN FEET

LEGEND:

- TEMPORARY TREE PROTECTION FENCE
- TEMPORARY STRUCTURE PROTECTION
- TREE TRUNK PROTECTION
- TREE TO BE REMOVED – CLEAR & GRUB ROOTS
- R&S REMOVED AND STACK
- P&P PRESERVE AND PROTECT
- R&D REMOVE AND DISCARD
- WOOD CHIP MULCH

NOTES:

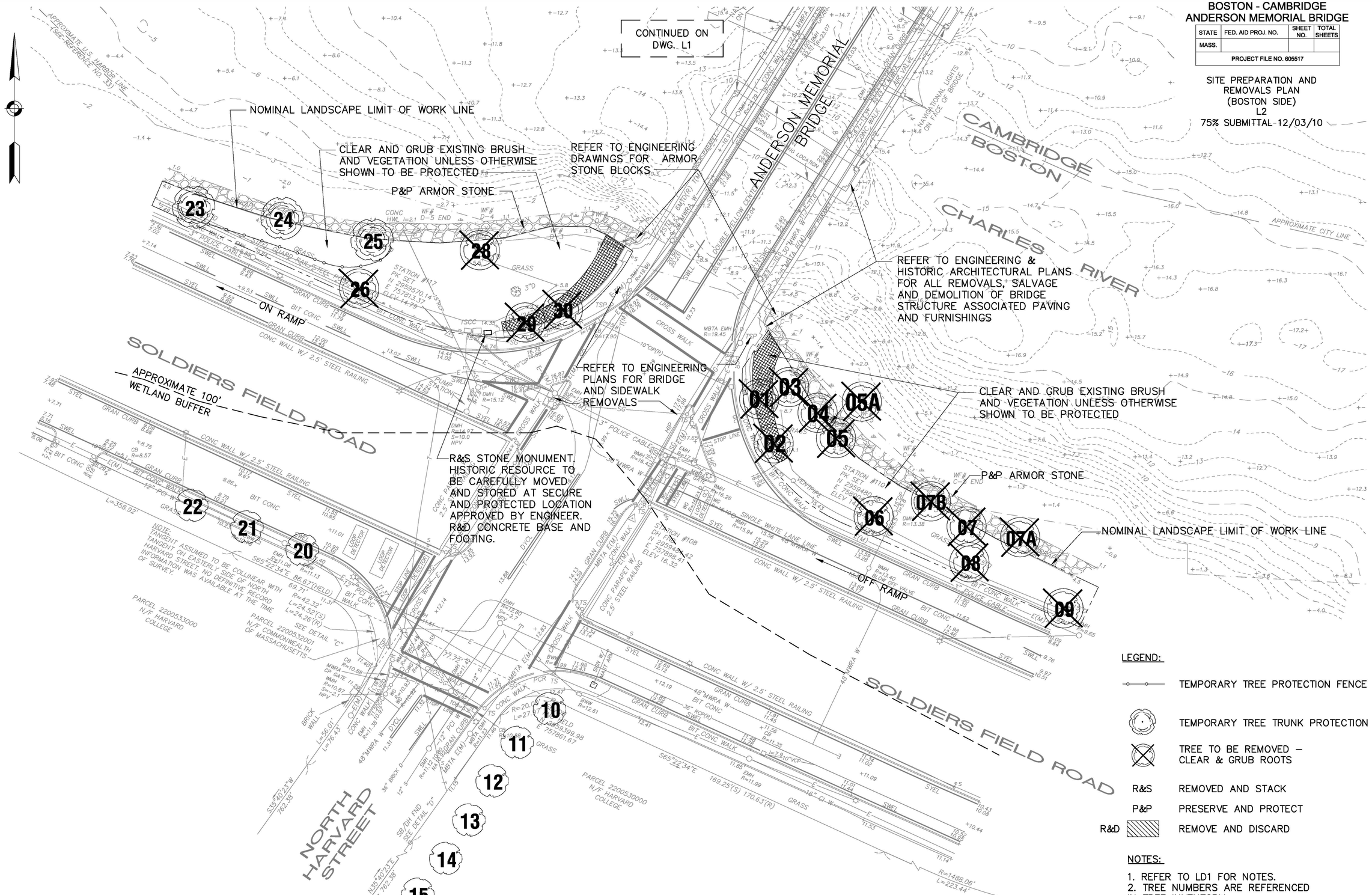
1. REFER TO LD1 FOR NOTES.
2. TREE NUMBERS ARE REFERENCED IN TREE INVENTORY.

FS&T DWG. NO.
VQ-061
DES CHK
DR CHK
EST CHK
ENGINEER IN CHARGE

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.			
PROJECT FILE NO. 605517			

SITE PREPARATION AND REMOVALS PLAN (BOSTON SIDE)
L2
75% SUBMITTAL 12/03/10



LEGEND:

- TEMPORARY TREE PROTECTION FENCE
- TEMPORARY TREE TRUNK PROTECTION
- TREE TO BE REMOVED – CLEAR & GRUB ROOTS
- R&S REMOVED AND STACK
- P&P PRESERVE AND PROTECT
- R&D REMOVE AND DISCARD

NOTES:

1. REFER TO LD1 FOR NOTES.
2. TREE NUMBERS ARE REFERENCED IN TREE INVENTORY.

FS&T DWG. NO.
VQ-061

DES		CHK	
DR		CHK	
EST		CHK	
ENGINEER IN CHARGE			

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.			
PROJECT FILE NO. 605517			

LAYOUT, MATERIALS AND GRADING PLAN
(CAMBRIDGE SIDE)
L3
75% SUBMITTAL 12/03/10

MEET AND MATCH EXISTING WALK GRADE

MEET AND MATCH EXISTING WALK

MEMORIAL DRIVE

JFK STREET

JOHN F. KENNEDY PARK

MAP 164 LOT 7
N/F COMMONWEALTH OF MASSACHUSETTS

MAP 161 LOT 58
N/F PRESIDENT & FELLOWS OF HARVARD COLLEGE

HOT MIX ASPHALT SIDEWALK

SINGLE WHITE LANE LINE

APPROXIMATE 100' WETLAND BUFFER

1.5% TYP.

BASELINE FOR DIMENSIONING OUTER WALKWAY EDGE FROM FACE OF BRIDGE PIER

REFER TO L5 PLANTING PLAN TO CONFIRM TREE LAYOUT RELATED TO BENCHES

TRANSITION FROM 10' TO EXISTING WIDTH

30'

10'

PLAN AT BENCH (4/LD3)

TRASH RECEPTACLE–DCR (9/LD3)

STABILIZED AGGREGATE PAVING (3/LD3)

REFER TO BRIDGE DRAWINGS FOR SIDEWALKS

MEET AND MATCH EXISTING WALK GRADE

NOMINAL LANDSCAPE LIMIT OF WORKLINE

CHARLES RIVER

BICYCLE RINGS (1/LD4)

TRASH RECEPTACLE–DCR (9/LD3)

BOTTOM OF STEP SHALL BE AT HEIGHT OF OTHER STAIR RISERS

BOTTOM OF WALL GRADES SHALL CONFORM TO ENGINEERING DRAWINGS OF WALL ELEVATIONS

ALIGN PATH WITH OUTSIDE OF PIERS

RESTORE RIPRAP–REFER TO ENGINEERING DRAWINGS

SLOPE STABILIZATION (3/LD4)

SLOPE STABILIZATION (3/LD4)

ANDERSON MEMORIAL BRIDGE

WELD BOATHOUSE

"WELD BOAT HOUSE"
2 STORY STONE/BRICK

STEEL HANDRAIL

GRAN STEPS

GRAN RET WALL

CONC WALK

DOCK

APPROXIMATE U.S. HARBOR LINE
(SEE REFERENCE NO'S. 27 & 33)

NOMINAL LANDSCAPE LIMIT OF WORKLINE

RESTORE RIPRAP–REFER TO ENGINEERING DRAWINGS

CONTINUED ON DWG. L4

NOTES:

1. REFER TO ENGINEERING PLANS FOR ALL ROADWAY AND SIDEWALK GRADES.

2. ALL OTHER SITE GRADES SHALL BE RESTORED TO EXISTING GRADIENTS EXCEPT WHERE NOTED.

20 0 20 40
SCALE IN FEET

FS&T DWG. NO.
VQ-061
DES CHK
DR CHK
EST CHK
ENGINEER IN CHARGE

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.			
PROJECT FILE NO. 605517			

LAYOUT, MATERIALS AND GRADING PLAN
(BOSTON SIDE)
L4
75% SUBMITTAL 12/03/10

CONTINUED ON DWG. L3

5 LD2 GEOTEXTILE FABRIC FOR STABILIZATION

RESET/RESTORE ARMOR STONE BLOCKS AS REQUIRED— REFER TO ENGINEERING DRAWINGS

3 LD4 SLOPE STABILIZATION

NOMINAL LANDSCAPE LIMIT OF WORK LINE

REFER TO CIVIL DWGS. FOR SIDEWALKS

MONUMENT RESETTING 4 LD4

SLOPE STABILIZATION 3 LD4

5 LD2 GEOTEXTILE FABRIC FOR STABILIZATION

NOMINAL LANDSCAPE LIMIT OF WORK LINE

ANDERSON MEMORIAL BRIDGE

CAMBRIDGE

BOSTON

CHARLES RIVER

APPROXIMATE CITY LINE

ON RAMP

OFF RAMP

SOLDIERS FIELD ROAD

NORTH HARVARD STREET

APPROXIMATE 100' WETLAND BUFFER

APPROXIMATE U.S. HARBOR LINE (SEE REFERENCE NO. 33)

NOTE: TANGENT ASSUMED TO BE COLLINEAR WITH TANGENT ON EASTERLY SIDE OF NORTH HARVARD STREET. NO DEFINITIVE RECORD INFORMATION WAS AVAILABLE AT THE TIME OF SURVEY.

PARCEL 2200530000 N/F HARVARD COLLEGE

PARCEL 2200532001 N/F COMMONWEALTH OF MASSACHUSETTS

PARCEL 2200533000 N/F HARVARD COLLEGE

20 0 20 40
SCALE IN FEET

FS&T DWG. NO.			
VQ-061			
DES		CHK	
DR		CHK	
EST		CHK	
ENGINEER IN CHARGE			

[Michal_J] - January 13, 2011 - 12:52pm - R:\VQ-061 Larz Anderson\05 Civil\Drawings\ENF\2011-01-13 Rev2-ENF\Landscape Plans\L4.dwg [Layout1]

PLANT LIST–CAMBRIDGE SIDE

QTY	SYMBOL	BOTANICAL NAME	COMMON NAME	PLANT TYPE	SIZE	REMARKS
11	ARO	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY RED MAPLE	DECIDUOUS TREE	2"–2.5" CALIPER	B&B, SINGLE STEM
5	CK	CLADRASTIS KENTUCKEA	AMERICAN YELLOWWOOD	DECIDUOUS TREE	3"–3.5" CALIPER	B&B, SINGLE STEM
2	LSM	LIQUIDAMBAR STYRACIFLUA 'MORAINE'	MORAINE SWEETGUM	DECIDUOUS TREE	3"–3.5" CALIPER	B&B, SINGLE STEM
5	LT	LIRIODENDRON TULIPIFERA	TULIP TREE	DECIDUOUS TREE	3"–3.5" CALIPER	B&B, SINGLE STEM
2	TAA	TILIA AMERICANA 'AMERICAN SENTRY'	AMERICAN SENTRY LINDEN	DECIDUOUS TREE	3"–3.5" CALIPER	B&B, SINGLE STEM
3	QB	QUERCUS BICOLOR	SWAMP WHITE OAK	DECIDUOUS TREE	3"–3.5" CALIPER	B&B, SINGLE STEM
4	QP	QUERCUS PALUSTRIS	PIN OAK	DECIDUOUS TREE	3"–3.5" CALIPER	B&B, SINGLE STEM

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.			
PROJECT FILE NO. 605517			

PLANTING PLAN
(CAMBRIDGE SIDE)
L5
75% SUBMITTAL 12/03/10

EXISTING PLANE TREE TO REMAIN
(5) CK
SCARIFIED AND SEEDED LAWN (AT DISTURBED/ COMPACTED AREAS) 3/LD2
(2) LT
(3) QP
TREE PLANTING 2/LD2
(1) QP
(3) LT
(8) ARO
(2) QB
(1) QB
EXISTING PLANE TREES TO REMAIN
EXISTING TREES TO REMAIN
MEMORIAL DRIVE
ANDERSON MEMORIAL BRIDGE
CHARLES RIVER
(2) TAA
EXISTING PLANE TREE TO REMAIN
(2) LSM
SCARIFIED AND SEEDED LAWN (AT DISTURBED/COMPACTED AREAS) 3/LD2
EXISTING AMERICAN ELM TREE TO REMAIN
NOMINAL LANDSCAPE LIMIT OF WORK LINE
SEE NOTE 2
CONTINUED ON DWG. L6
APPROXIMATE 100' WETLAND BUFFER
3 EXISTING AMERICAN SENTRY LINDEN TREES TO REMAIN
"WELD BOAT HOUSE" 2 STORY STONE/BRICK
WELD BOATHOUSE
2/LD2 TREE PLANTING
NOMINAL LANDSCAPE LIMIT OF WORK LINE
(3) ARO
3/LD2 SCARIFIED AND SEEDED LAWN (AT DISTURBED/COMPATED AREAS)
APPROXIMATE U.S. HARBOR LINE (SEE REFERENCE NO'S. 27 & 33)
MAP 161 LOT 58 N/F PRESIDENT & FELLOWS OF HARVARD COLLEGE
DOCK
FLOW

20 0 20 40
SCALE IN FEET

NOTES:

1. REFER TO LD1 FOR PLANTING NOTES.
2. REFER TO L3 FOR SLOPE STABILIZATION.

FS&T DWG. NO.
VQ-061
DES CHK
DR CHK
EST CHK
ENGINEER IN CHARGE

PLANT LIST–BOSTON SIDE

QTY	SYMBOL	BOTANICAL NAME	COMMON NAME	PLANT TYPE	SIZE	REMARKS
7	QP	QUERCUS PALUSTRIS	PIN OAK	DECIDUOUS TREE	3"–3.5" CALIPER	B&B, SINGLE STEM
6	TAA	TILIA AMERICANA 'AMERICAN SENTRY'	AMERICAN SENTRY LINDEN	DECIDUOUS TREE	3"–3.5" CALIPER	B&B, SINGLE STEM

CONTINUED ON DWG. L5

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.			
PROJECT FILE NO. 605517			

PLANTING PLAN
(BOSTON SIDE)
L6
75% SUBMITTAL 12/03/10

EXISTING TREES TO REMAIN
R73'
63°
SEEDING–RESTORATION MIX SEE NOTE 2 (3/LD2)
5' SETBACK FROM WALK
3 TAA
3 QP
ON RAMP
TREE PLANTING (2/LD2)
SEE NOTE 3
SEEDED SLOPE (6/LD2)
NOMINAL LANDSCAPE LIMIT OF WORK LINE
APPROXIMATE 100' WETLAND BUFFER
SOLDIERS FIELD ROAD
CAMBRIDGE
BOSTON
CHARLES RIVER
APPROXIMATE CITY LINE
50'
44°
R90'–6"
3 TAA
SEEDED SLOPE (6/LD2)
SEEDING–RESTORATION MIX SEE NOTE 2 (3/LD2)
TREE PLANTING (2/LD2)
4 QP
5' SETBACK FROM WALK
OFF RAMP
EQ
25' O.C. TYP.
NORTH HARVARD STREET
PARCEL 2200530000 N/F HARVARD COLLEGE
PARCEL 2200532001 N/F COMMONWEALTH OF MASSACHUSETTS
PARCEL 2200533000 N/F HARVARD COLLEGE
NAVIGATIONAL LIGHTS ON FACE OF BRIDGE
STATION #108 N 2859394.42 E 757899.41 ELEV. 16.32
N 2859399.98 E 757861.67 HELD
S65°22'34"E 169.25'(S) 170.63'(R)
S65°22'34"E 86.67'(HELD) 69.7'(R) L=42.32' L=24.52'(S) L=24.26'(R)
L=356.92'
L=56.01' L=76.43'
S35°40'23"W 762.38'
S40°23'E 38'

NOTE:
TANGENT ASSUMED TO BE COLLINEAR WITH TANGENT ON EASTERLY SIDE OF NORTH HARVARD STREET. NO DEFINITIVE RECORD INFORMATION WAS AVAILABLE AT THE TIME OF SURVEY.

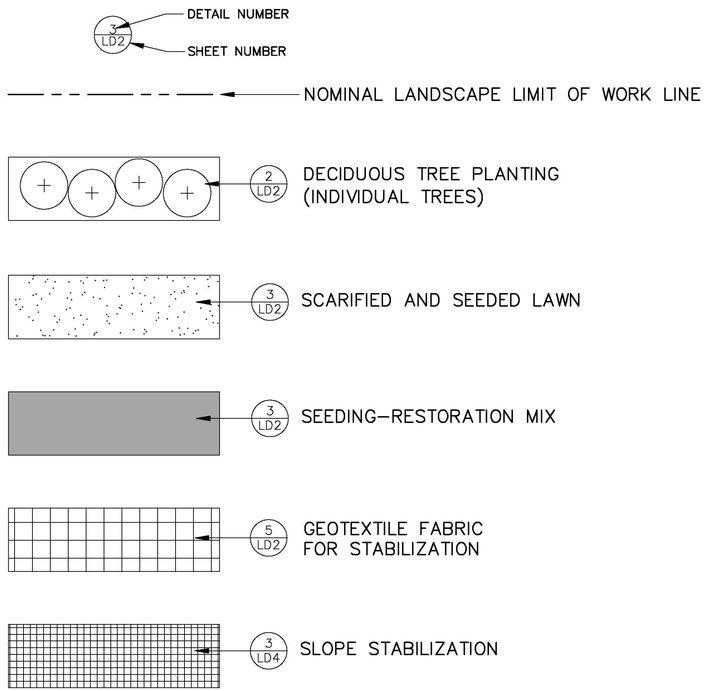
NOTES:

1. REFER TO LD1 FOR PLANTING NOTES.
2. REFER TO L4 FOR GEOTEXTILE FABRIC FOR STABILIZATION APPLIED IN CONJUNCTION WITH SEEDED SLOPES.
3. REFER TO L4 FOR SLOPE STABILIZATION.

20 0 20 40
SCALE IN FEET

FS&T DWG. NO.
VQ-061
DES CHK
DR CHK
EST CHK
ENGINEER IN CHARGE

LANDSCAPE LEGEND



LANDSCAPE NOTES

(REFER TO STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS FOR ADDITIONAL INFORMATION)

GENERAL NOTES

1. THE LANDSCAPE DESIGN FOR THE REHABILITATION OF THE ANDERSON MEMORIAL BRIDGE INCORPORATES APPROPRIATE CONFORMANCE TO MASTER PLAN FOR THE CHARLES RIVER BY GOODY CLANCEY ASSOCIATES FOR THE DEPARTMENT OF CONSERVATION AND RECREATION (DCR).

2. THE INTENT OF THE DESIGN IS ALSO TO INCORPORATE AS MUCH AS POSSIBLE APPEARNACE OF KNOWN HISTORICAL FEATURES AND MASSDOT PROJECT DEVELOPMENT AND DESIGN GUIDE, CHAPTER 13 –LANDSCAPE AND AESTHETICS. CONTEMPORARY MATERIALS ARE SHOWN WHERE APPOPRIATE.

3. DEVIATION FROM ACCURATE HISTORICAL RESTORATION COULD HAVE RESULTED FROM SUBSEQUENT SITE CHANGES SUCH AS ROADWAYS OR BRIDGES, OR FROM PRESENT DAY CHANGES IN USE, CODES, OR DESIGN GUIDELINES.

4. ACCESSIBILITY GUIDELINES, PUBLIC SAFETY AND DCR MAINTENANCE PRACTICES HAVE BEEN TAKEN INTO CONSIDERATION. THESE CONSIDERATIONS MAY ALSO HAVE RESULTED IN DEVIATION FROM HISTORIC DESIGNS.

LAYOUT NOTES

1. ALL DIMENSION LINES ARE EITHER PARALLEL OR PERPENDICULAR TO LINES FROM WHICH THEY ARE DRAWN UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

2. BEFORE LANDSCAPE ITEMS ARE CONSTRUCTED, SUBMITTALS MUST BE APPROVED, ALL LOCATIONS SHALL BE STAKED IN THE FIELD, MOCKUPS CONSTRUCTED IF INDICATED IN SPECIAL PROVISIONS, VERIFIED BY THE CONTRACTOR AND REVIEWED BY THE ENGINEER. ADJUSTMENTS SHALL BE MADE AT NO ADDITIONAL COST TO THE DEPARTMENT.

3. REFER TO STANDARD SPECIFICATIONS FOR MATERIALS AND INSTALLATION, IF NOT COVERED IN PROJECT PLANS AND SPECIFICATIONS.

4. TREE PROTECTION FENCING AS INDICATED ON SITE PREPARATION AND REMOVALS PLANS SHALL BE INSTALLED BEFORE CONSTRUCTION VEHICLES ACCESS OR CONSTRUCTION OCCURS WITHIN 25 FEET OF ANY EXISTING TREE TO REMAIN. FENCING SHALL BE INSTALLED WHERE SHOWN ON THE DRAWINGS AND WITH REVIEW OF ENGINEER. REMOVAL SHALL BE AT COMPLETION OF CONSTRUCTION IN THE VICINITY. REFER TO SPECIAL PROVISIONS FOR ADDITIONAL PROTECTION AND PRUNING REQUIREMENTS.

5. TREE ROOTS SHOULD BE PROTECTED UP TO THE DRIP LINE WHENEVER POSSIBLE.

PLANTING NOTES

1. VERIFY THAT PROPOSED PLANTINGS DO NOT CONFLICT WITH UTILITIES IN THE FIELD BEFORE LAYING OUT PLANTINGS. ROOT BALLS OF PROPOSED TREES SHALL NOT BE LOCATED WITHIN 3 HORIZONTAL FEET OF AN EXISTING GAS MAIN OR OTHER UTILITY LINE OR FIXTURE.

2. ALL PLANT MATERIAL SHALL CONFORM TO THE GUIDELINES ESTABLISHED BY THE "AMERICAN STANDARD FOR NURSERY STOCK" PUBLISHED BY AMERICAN ASSOCIATION OF NURSERYMEN, LATEST EDITION, OR AS INDICATED IN THE PLANT LIST WHICH SHALL GOVERN.

3. ALL PLANT MATERIAL SHALL BE FIELD SELECTED IN NURSERIES BY THE ENGINEER AFTER PRELIMINARY TAGGING BY CONTRACTOR. ALL STOCK SHALL BE NURSERY GROWN.

4. ENGINEER SHALL REVIEW PLACEMENT OF PLANTS IN FIELD BEFORE INSTALLATION AFTER STAKING IN FIELD BY CONTRACTOR ACCORDING TO PLANTING PLANS AND SITE DETAILS. THE CONTRACTOR SHALL INFORM THE ENGINEER IMMEDIATELY OF ANY CONFLICTS BETWEEN PROPOSED PLANT LOCATIONS AND BELOW GRADE UTILITIES, STRUCTURES, DRAINAGE PROBLEMS OR ANY OTHER PLANTING CONFLICT ENCOUNTERED OR ANTICIPATED AND REVIEWED WITH THE ENGINEER BEFORE CONSTRUCTION COMMENCES.

5. THE CONTRACTOR SHALL SUPPLY ALL PLANT MATERIALS IN SIZES AND QUANTITIES SUFFICIENT TO COMPLETE THE PLANTING SHOWN ON THE DRAWINGS. THE NUMBERS OF PLANTS GIVEN IN MASSINGS AND ON THE PLANT LIST IS APPROXIMATE AND CONTRACTOR SHALL PLANT TREES AT THE SPACING INDICATED ON THE PLANS AND AS DETAILED. THE ENGINEER HAS THE RIGHT TO REJECT INJURED, DISEASED, DESICCATED OR INCORRECT SPECIES AT ANY TIME.

6. ALL PLANTS THAT ARE DELIVERED TO THE SITE AND NOT PLANTED IMMEDIATELY SHALL BE STORED AND WATERED PROPERLY, ACCORDING TO THE SPECIFICATIONS, IN SECURE LOCATIONS REVIEWED BY THE ENGINEER. ALL PLANTS SHALL HAVE A TWO–YEAR GUARANTEE, FROM THE TIME OF PRELIMINARY ACCEPTANCE.

7. TREES SHALL BE GUYED OR ANCHORED SECURELY AS INDICATED ON THE LANDSCAPE DETAILS.

8. ALL NEW PLANT MATERIAL WITHIN THE LANDSCAPE LIMIT OF WORK LINE SHALL BE PRUNED AFTER PLANTING TO REMOVE ALL DEAD OR DAMAGED BRANCHES. TREE WOUND DRESSING SHALL NOT BE USED ON ANY PLANTINGS. ALL NEW PLANTINGS SHALL BE WATERED AS NECESSARY FROM DELIVERY UNTIL THE END OF THE PLANT ESTABLISHMENT PERIOD.

9. ALL PLANTS SHALL BEAR THE SAME RELATION TO FINISHED GRADE AS TO ORIGINAL GRADE BEFORE DIGGING, UNLESS OTHERWISE DETAILED, AND SHALL HAVE A MULCHED SAUCER ACCORDING TO DETAILS. PLANT PITS SHALL DRAIN, OR PLANTS LOCATED IN AREAS THAT DO NOT DRAIN SHALL BE MOVED TO NEW LOCATIONS AT NO ADDITIONAL COST TO THE CONTRACT.

10. ALL PAPER, FIBER–POT, OR PLASTIC CONTAINERS AND PLASTIC OR IRON FASTENERS AND ROPE SHALL BE REMOVED FROM PLANTS BEFORE SETTING IN PLANT PIT. WIRE BASKETS AND TWINE SHALL BE CAREFULLY TRIMMED OFF AT LEAST THE TOP TWO THIRDS OF THE ROOTBALLS. ROOTBALLS SHALL BE HANDLED CAREFULLY SO AS TO NOT CRACK OR BREAK. PLANTS SHALL NOT BE LIFTED BY THEIR TRUNKS OR STEMS. UNTIE AND TURN DOWN BURLAP TWO–THIRDS, PER DETAIL.

11. EXISTING STACKED TOPSOILS SHALL BE UTILIZED IN THE FORMULATION OF PLANTING SOIL MIXTURE. FOR PLANTING SOIL MIXTURES AROUND ROOTBALLS, A MINIMUM OF SPECIFIED AMOUNT OF STACKED AND STOCKPILED TOPSOIL SHALL BE INCORPORATED INTO THE PLANTING SOIL MIX. ALL GRASS, SOD, ROOTS, AND STONES OVER 1–INCH DIAMETER SHALL BE REMOVED FROM ALL SOILS FOR PLANTING AND SEEDING AND LEGALLY DISPOSED OF.

12. TREE TRUNKS SHALL BE INSTALLED 10 FT. CLEAR FROM ALL HYDRANTS AND STANDPIPES TO ENSURE THEIR VISIBILITY AT ALL TIMES.

13. PLANT SPACING SHALL BE AS INDICATED ON THE DRAWINGS OR IN THE PLANT LIST. MULCH TREE SAUCERS WITH 3–INCH DEPTH AGED PINE BARK TO LIMITS OF SAUCERS AS SHOWN ON LANDSCAPE PLANS.

PLANTING SOIL AND GRADING NOTES

1. ANY DISCREPANCIES OR CONFLICTS ARISING BETWEEN EXISTING CONDITIONS AND THE GRADING PLANS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING.

2. GRADE STAKES SHOWING DEPTH OF SOIL AMENDED WITH COMPOST SHALL BE REVIEWED BY ENGINEER IN FIELD BEFORE FINAL GRADING CAN COMMENCE.

3. ALL NEW PLANTINGS SHALL HAVE A MINIMUM DEPTH OF PLANTING SOIL MIX, AS INDICATED ON THE DRAWINGS. ALL SEEDED AREAS SHALL HAVE COMPOST TILLED INTO TOP 4–INCH DEPTH OF SOIL. PLANTING SOIL SHALL BE REQUIRED TO BE TESTED FOR CONFORMANCE WITH SPECIFICATIONS BEFORE PLANTING OR SEEDING. SOIL MAY NOT BE WORKED IN A WET OR FROZEN STATE OR IT MAY BE REJECTED BY THE ENGINEER.

4. IN AREAS WHERE PLANTING OR SEEDING OCCURS ON EXISTING GRADES, AREAS SHALL BE CLEARED, DISCED AND/OR FILLED AND SOIL AMENDED TO MEET THE RANGES AND MINIMUM REQUIREMENTS FOR PLANTING SOIL. IF EXISTING TOPSOIL CANNOT BE AMENDED TO MEET SPECIFICATIONS, IT SHALL BE EXCAVATED AND REPLACED WITH APPROVED SOIL.

5. WITHIN LANDSCAPED AREAS, ALL EXISTING OR PROPOSED INLET COVERS, GRATES, ETC. SHALL BE SET AND ADJUSTED BY THE CONTRACTOR TO BE FLUSH WITH THE FINISHED GRADE.

6. THE CONTRACTOR'S WORK SHALL BE SCHEDULED TO ALLOW THE FINISHED SUBGRADE ELEVATIONS TO DRAIN PROPERLY WITHOUT PUDDLING. PROVIDE TEMPORARY POSITIVE DRAINAGE AS REQUIRED.

7. THE PROPOSED SITE PAVEMENTS, SURFACINGS, AND PLANTED AREAS SHALL BE PITCHED IN THE DIRECTIONS SHOWN ON THE DRAWINGS. IF NOT OTHERWISE SHOWN, PROPOSED PAVEMENT AREAS SHALL BE PITCHED A MINIMUM OF ONE PERCENT IN THE DIRECTION SHOWN ON THE DRAWINGS, AND PROPOSED SEEDED AND PLANTED AREAS SHALL BE PITCHED IN A MINIMUM OF ONE PERCENT TOWARD A DRAIN INLET OR BASIN.

8. CONTRACTOR SHALL MEET EXISTING GRADES IN A SMOOTH MANNER, WITHOUT DISTURBING DRAINAGE CONDITIONS, AND SHALL PROTECT EXISTING VEGETATION AND PROTECTIVE FENCING. THE CONTRACTOR SHALL REQUEST THAT THE ENGINEER REVIEW THE FINISHED GRADES BEFORE PLANTING AND SEEDING OPERATIONS BEGIN.

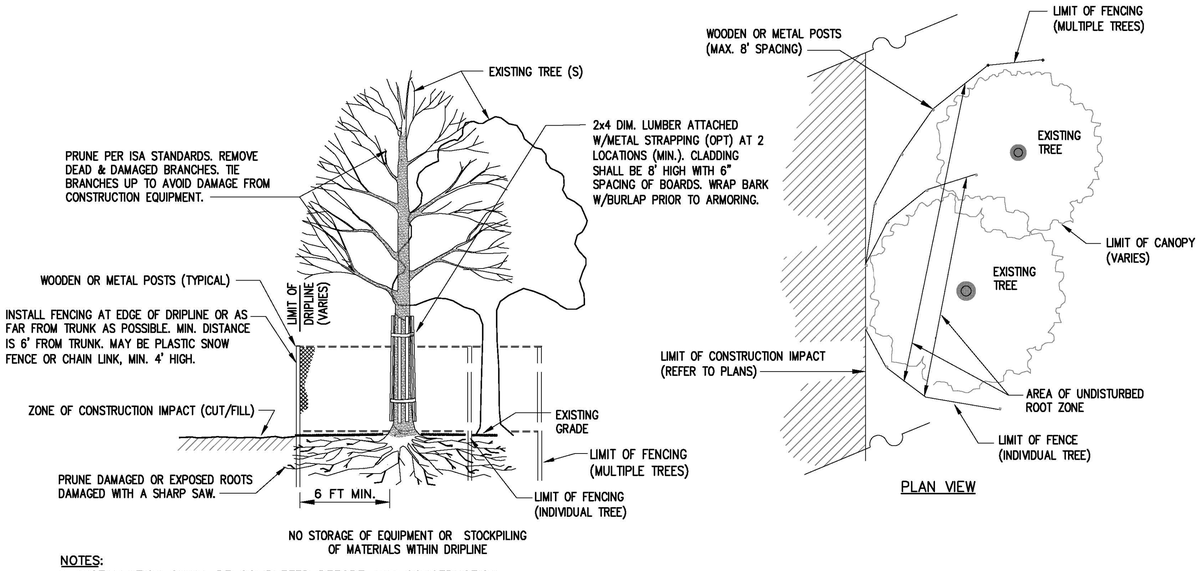
9. ALL AREAS WITHIN THE LIMIT OF WORK WHICH ARE DISTURBED, SHALL BE SEEDED, IF NO OTHER PLANTINGS ARE INDICATED AND THE AREA IS NOT PAVED. SEEDING TYPE(S) SHALL BE RELATED TO SURROUNDING SEEDING TYPES AND USES, AS DETERMINED BY THE ENGINEER.

BOSTON - CAMBRIDGE
ANDERSON MEMORIAL BRIDGE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.			
PROJECT FILE NO. 605517			

LANDSCAPE NOTES AND LEGEND
SHEET 1 OF 4
LD1
75% SUBMITTAL 12/03/10

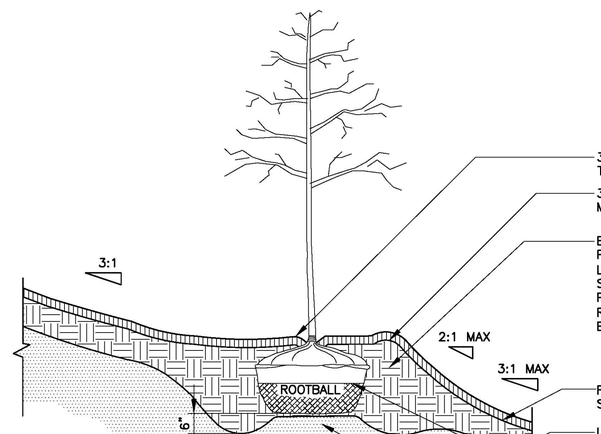
FS&T DWG. NO.			
VQ-061			
DES		CHK	
DR		CHK	
EST		CHK	
ENGINEER IN CHARGE			



NOTES:
1. INSTALLATION SHALL BE COMPLETED BEFORE ANY CONSTRUCTION VEHICLES ACCESS THE SITE OR ANY OTHER SITE PREPERATION, DEMOLITION, SALVAGE OR CONSTRUCTION COMMENCES.
2. REFER TO PLANS FOR FENCE LOCATIONS.

① TREE PROTECTION – EXISTING TREE(S)

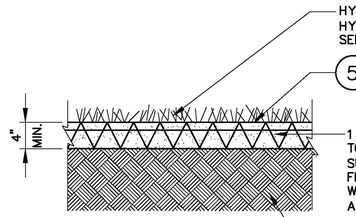
SCALE: NOT TO SCALE



NOTES:
1. PLANTING ON SLOPE OVER 4:1 SHOWN. ON SLOPES LESS THAN 4:1 3" EARTH SAUCER SHALL EXTEND ENTIRELY AROUND PLANTING.

② TREE PLANTING

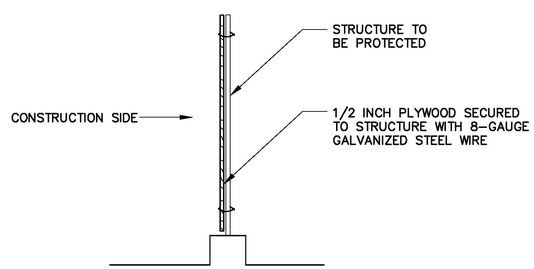
SCALE: NOT TO SCALE



NOTES:
1. REFER TO PLANS FOR SPECIFIC SEED MIX TYPES.
2. DO NOT DISC SOIL WITHIN 10 FT. OF EXISTING TREE TRUNKS – MANUALLY CULTIVATE ONLY.
3. AFTER COMPLETION AND REVIEW BY ENGINEER, PROTECTIVE FENCING SHALL BE INSTALLED AT PERIMETER OF ALL SEEDED AREAS UNTIL ACCEPTANCE.

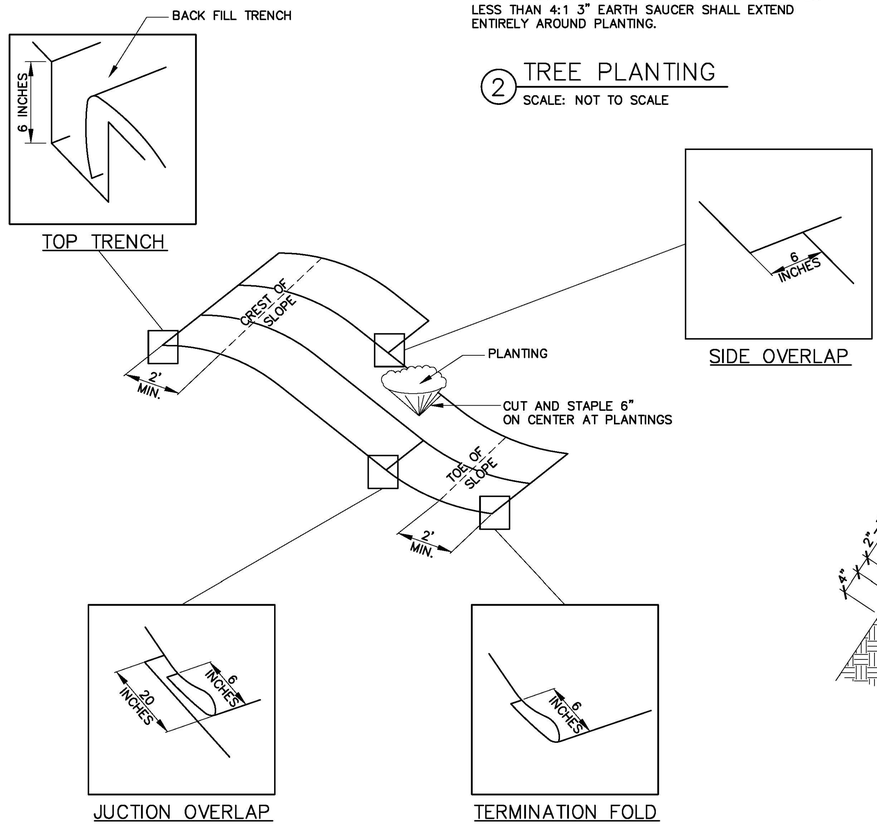
③ SCARIFIED AND SEEDED LAWN AND SEEDING–RESTORATION MIX

SCALE: NOT TO SCALE



④ TEMPORARY STRUCTURE PROTECTION

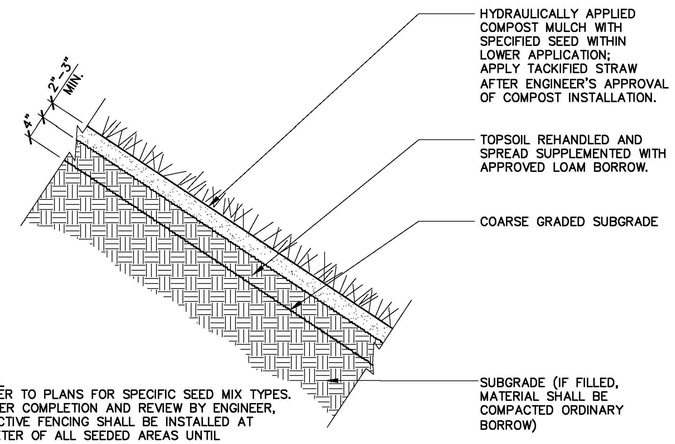
SCALE: NOT TO SCALE



NOTE:
1. REFER TO SPECIAL PROVISIONS FOR SPACING OF WIRE STAPLES.

⑤ GEOTEXTILE FABRIC FOR STABILIZATION

SCALE: NOT TO SCALE

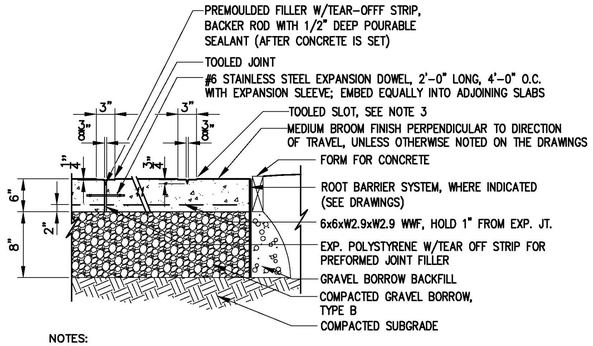


NOTES:
1. REFER TO PLANS FOR SPECIFIC SEED MIX TYPES.
2. AFTER COMPLETION AND REVIEW BY ENGINEER, PROTECTIVE FENCING SHALL BE INSTALLED AT PERIMETER OF ALL SEEDED AREAS UNTIL ACCEPTANCE.

⑥ SEEDED SLOPE

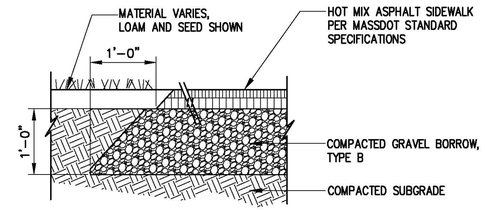
SCALE: 1"=1'–0"

FS&T DWG. NO.			
VQ-061			
DES		CHK	
DR		CHK	
EST		CHK	
ENGINEER IN CHARGE			



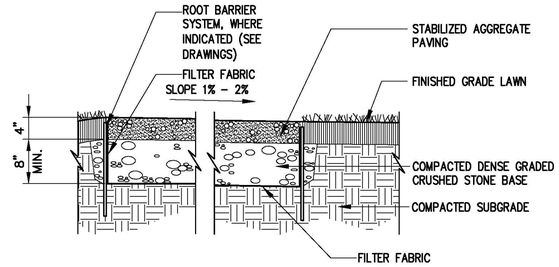
NOTES:
1. UTILIZE EXPANSION JOINT DETAIL FOR ALL CONSTRUCTION JOINT REQUIREMENTS, 30' O.C. MINIMUM.
2. UTILIZE 3/4" EXPANSION JOINT AT ALL VERTICAL STRUCTURE INTERFACES. USE 3/8" EXPANSION JOINTS AT ALL PAVING JOINTS.
3. PROVIDE CLEANLY TOOLED BORDER ALL AROUND JOINT.
4. WHEN EXISTING TREES ARE PRESENT WITHIN TEN (10) FEET OF PATH, REFER TO DETAIL 6 (THIS SHEET) FOR ROOT PRUNING.

1 CEMENT CONCRETE LANDSCAPE PAVING
SCALE: NOT TO SCALE



NOTE:
WHEN EXISTING TREES ARE PRESENT WITHIN TEN (10) FEET OF PATH, REFER TO SPECIAL PROVISIONS FOR ROOT PRUNING.

2 BITUMINOUS CONCRETE LANDSCAPE PAVING
SCALE: NOT TO SCALE

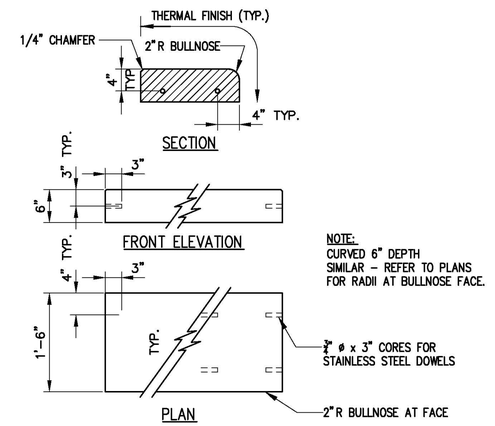


3 STABILIZED AGGREGATE PAVING
SCALE: NOT TO SCALE

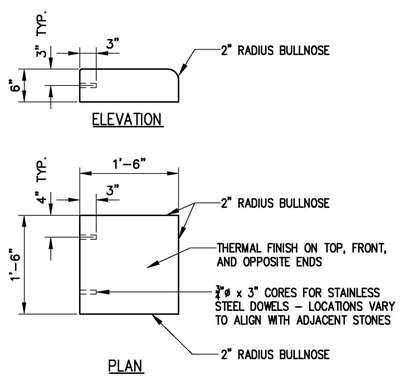
4 PLAN AT BENCH
SCALE: NOT TO SCALE

5 GRANITE LANDSCAPE EDGE
SCALE: NOT TO SCALE

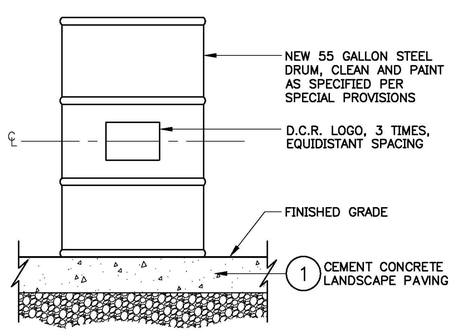
GRANITE LANDSCAPE EDGE, 6 18" SQUARE CORNER BLOCK
SCALE: NOT TO SCALE



7 GRANITE LANDSCAPE EDGE
SCALE: NOT TO SCALE



GRANITE LANDSCAPE EDGE, 8 18" SQUARE END BLOCK
SCALE: NOT TO SCALE



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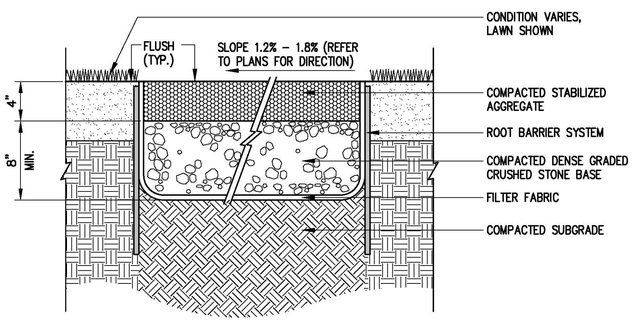

10 STABILIZED AGGREGATE PAVING
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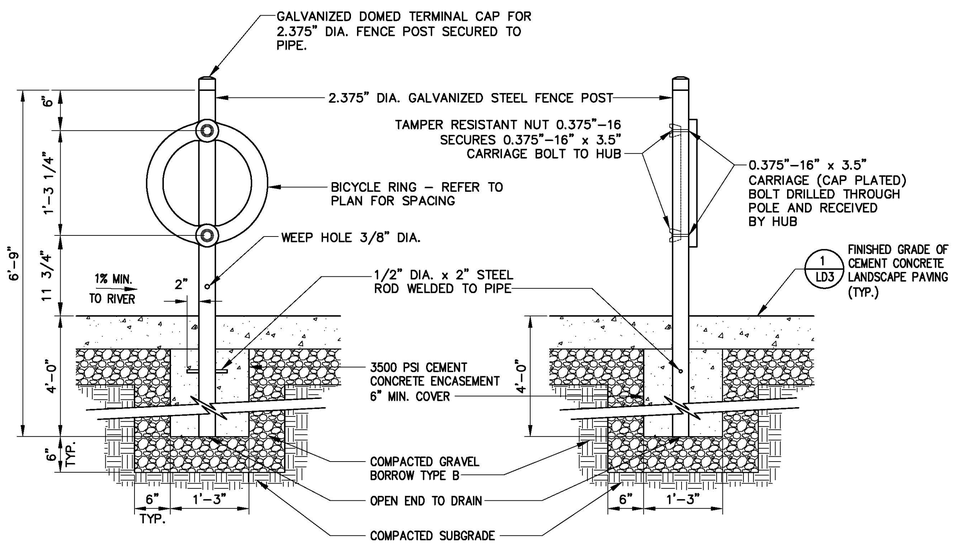
FS&T DWG. NO.
VQ-061

DES		CHK	
DR		CHK	
EST		CHK	

ENGINEER IN CHARGE



FRONT ELEVATION SIDE ELEVATION

BICYCLE RING DETAIL
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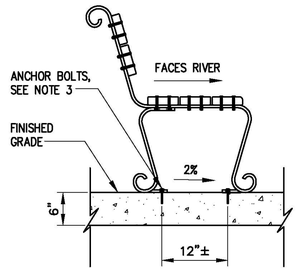
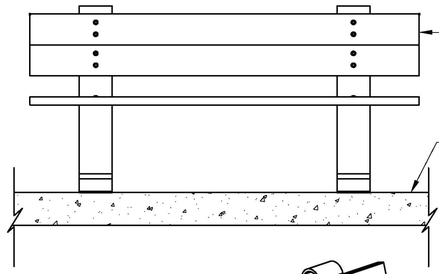
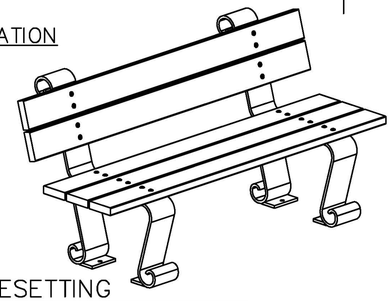


SECTION



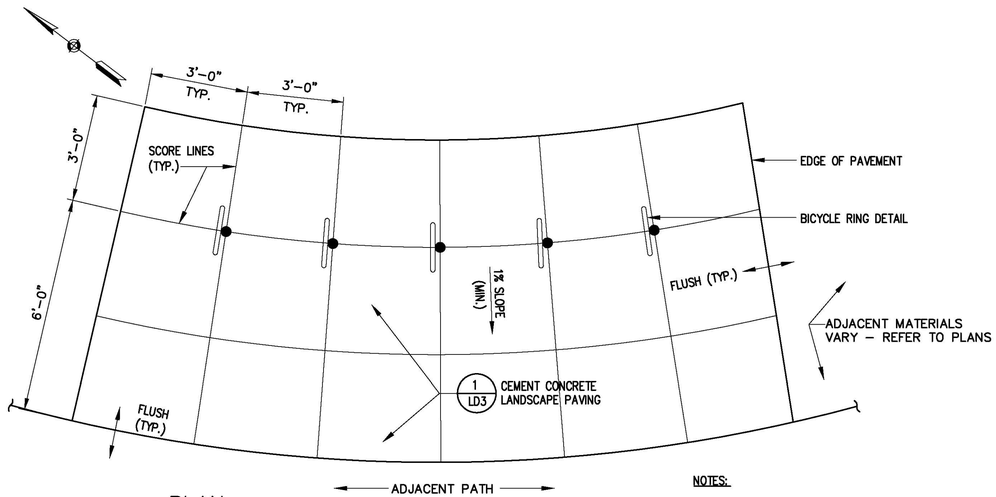
ELEVATION



NOTES:

1. TOUCH–UP ALL STEEL MEMBERS WITH ZINC RICH EPOXY TNEMEC GLOSS ENAMEL (HUNTER GREEN).
2. TOUCH–UP ALL WOOD SLATS WITH TNEMEC GLOSS ENAMEL (HUNTER GREEN).
3. BOLT IN PLACE WITH FOUR (4) 1/2" X 3 3/4" PLATED EXPANSION ANCHOR BOLTS.

(2) SHURCLIFF BENCH RESETTING
SCALE: NOT TO SCALE



PLAN

NOTES:

1. SEE PLAN FOR NUMBER OF BICYCLE RINGS.
2. REFER TO PLAN FOR RADIAL PACEMENT.

(1) BICYCLE RINGS
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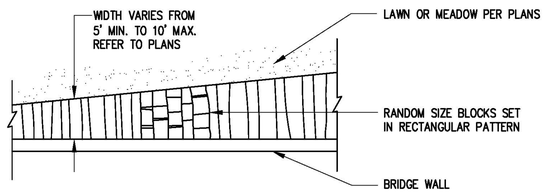

PLAN
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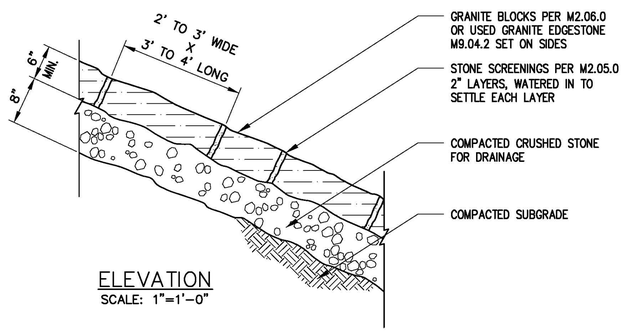
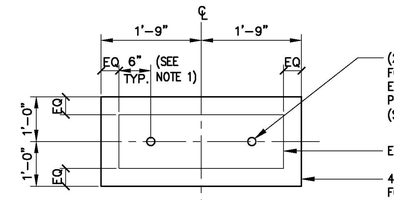
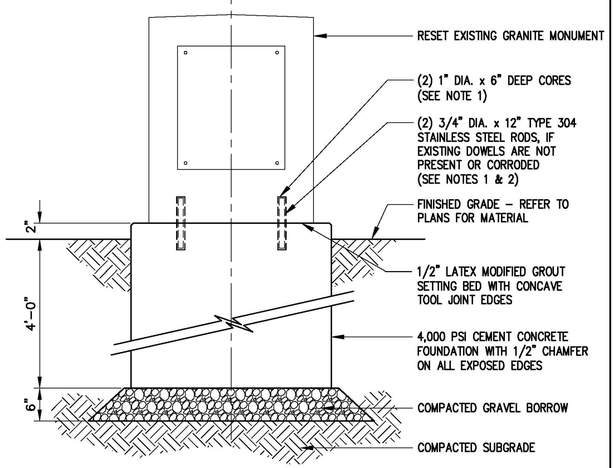


ELEVATION
SCALE: 1"=1'–0"

(3) SLOPE STABILIZATION
SCALE: VARIES



PLAN



ELEVATION

NOTES:

1. LOCATION OF DOWELS AND CORES AS SHOWN ARE FOR NEW DOWELS. ADJUST LOCATIONS AND SIZES IF OLD DOWELS ARE DETERMINED BY ENGINEER TO BE SOUND AND REUSABLE.
2. ENGINEER TO DETERMINE IF EXISTING DOWELS ARE REUSABLE.

(4) MONUMENT RESETTING
SCALE: NOT TO SCALE

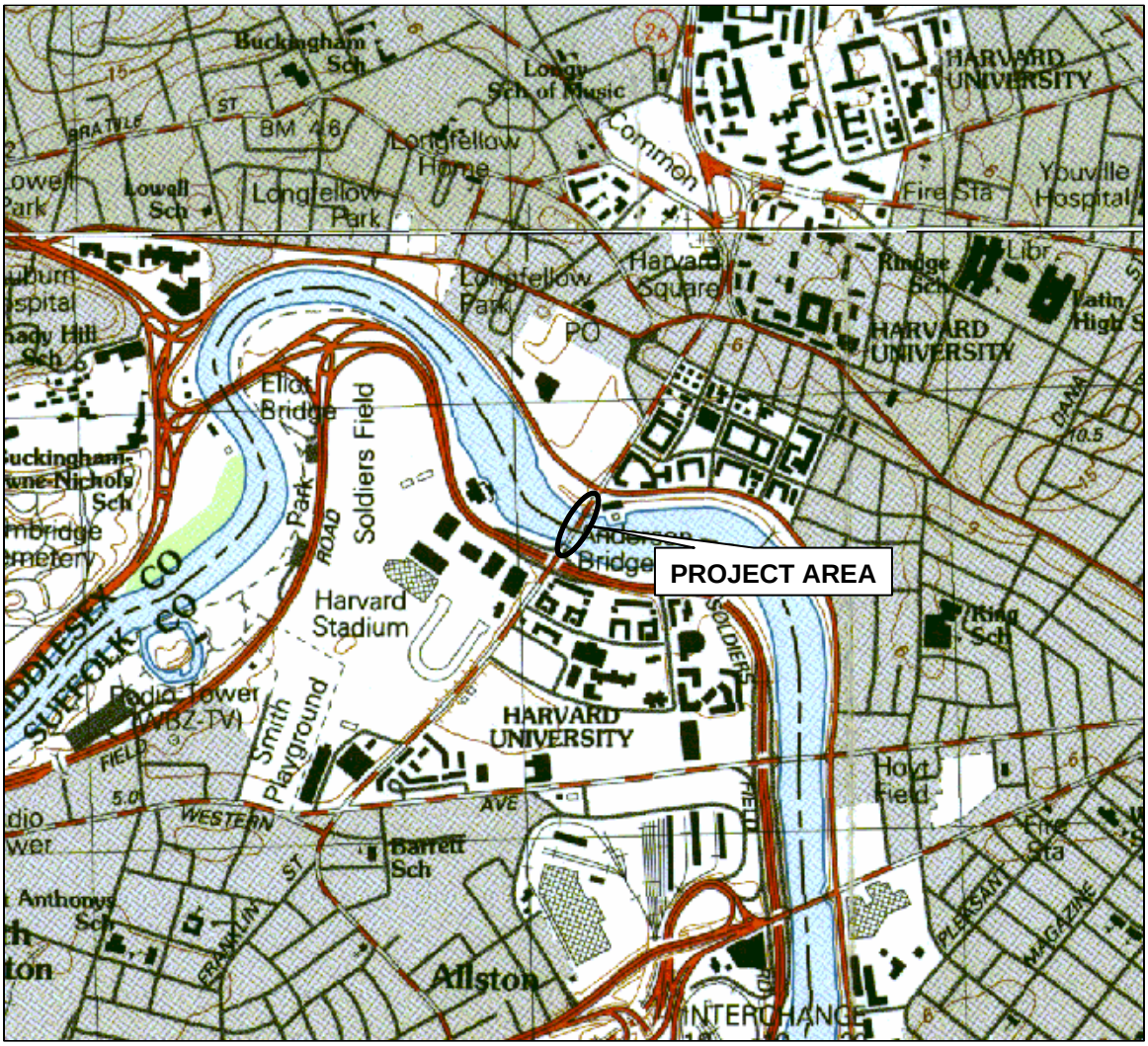
FS&T DWG. NO.
VQ-061

DES		CHK	
DR		CHK	
EST		CHK	

ENGINEER IN CHARGE

ATTACHMENT 3

U.S.G.S. Locus Map



CDW CONSULTANTS, INC.

PROJECT AREA

ANDERSON MEMORIAL BRIDGE
BOSTON AND CAMBRIDGE, MA

SOURCE: MassGIS Commonwealth of MA EOEEA

PROJECT NO.: 1158.00
SCALE: 1:25,000

ATTACHMENT 3

ATTACHMENT 4

ENF Circulation List

Anderson Memorial Bridge Rehabilitation Project
Boston and Cambridge, Massachusetts

Circulation List for Environmental Notification Form (ENF)

Secretary of Energy and Environmental Affairs
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114 (2 copies)

Undersecretary for Policy Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Department of Environmental Protection
Commissioner's Office
One Winter Street
Boston, MA 02108

Department of Environmental Protection
Northeast Region
Attention: MEPA Coordinator
205B Lowell Street
Wilmington, MA 01887

Department of Environmental Protection
Waterways – Chapter 91 Program
One Winter Street
Boston, MA 02108

Department of Environmental Protection
Northeast Regional Office BRP – Air Quality
205B Lowell Street
Wilmington, MA 01887

MassDOT (*Internal Distribution*)
Public/Private Development Unit
10 Park Plaza, Room 3510
Boston, MA 02116-3969

MassDOT (*Internal Distribution*)
Highway Division District 6
Attn: MEPA Coordinator
185 Kneeland Street
Boston, MA 02111

Massachusetts Aeronautics Commission (*Internal Distribution*)
Attn: MEPA Coordinator
10 Park Plaza, Room 6620
Boston, MA 02116-3966

Massachusetts Historical Commission
Massachusetts Archives Building
220 Morrissey Blvd.
Boston, MA 02125

Department of Conservation and Recreation
Attn: MEPA Coordinator
251 Causeway Street, Suite 600
Boston, MA 02114

Division of Marine Fisheries
Headquarters
Attn: Environmental Reviewer
251 Causeway Street, Suite 400
Boston, MA 02114

Department of Public Health
Director of Environmental Health
250 Washington Street
Boston, MA 02115

Massachusetts Coastal Zone Management Office
Attn: Project Review Coordinator
251 Causeway Street, Suite 800
Boston, MA 02114

Massachusetts Water Resources Authority
Attn: MEPA Coordinator
100 First Avenue Charlestown Navy Yard
Boston, MA 02129

Executive Office of Public Safety
One Ashburton Place, Suite 2133
Boston, MA 02108

Metropolitan Area Planning Council
60 Temple Place, 6th Floor
Boston, MA 02111

The Honorable Thomas M. Menino
Office of the Mayor
Boston City Hall
1 City Hall Square, Suite 500
Boston, MA 02201

City of Boston Redevelopment Authority
Director of Planning
Boston City Hall
1 City Hall Square, 9th Floor
Boston, MA 02201

City of Boston
Conservation Commission
Boston City Hall
1 City Hall Square, Room 805
Boston, MA 02201

Boston Public Health Commission
1010 Massachusetts Avenue, 2nd Floor
Boston, MA 02118

Boston Police Department
One Schroder Plaza
Boston, MA 02120-2014

Boston Fire Department – Planning & Logistics
115 Southampton Street
Boston, MA 02118

Boston Transportation Department
Boston City Hall
1 City Hall Plaza, Room 721
Boston, MA 02201

City of Boston
Environmental Department
Boston City Hall, Room 805
1 City Hall Plaza
Boston, MA 02201

City of Boston
Boston Landmarks Commission
Boston City Hall, 8th Floor
Boston, MA 02201

Boston Public Works Department
Boston City Hall
1 City Hall Plaza
Boston, MA 02201

Boston Water and Sewer Commission
980 Harrison Avenue
Boston, MA 02119

Boston City Council
Boston City Hall
1 City Hall Plaza, 5th Floor
Boston, MA 02201

The Honorable David Maher
Mayor of Cambridge
Cambridge City Hall
795 Massachusetts Ave
Cambridge, MA 02139

City of Cambridge
Conservation Commission
344 Broadway
Cambridge, MA 02139

City of Cambridge
Environmental and Transportation Planning Division
344 Broadway
Cambridge, MA 02139

City of Cambridge
Department of Community Development
344 Broadway
Cambridge, MA 02139

Cambridge Public Health Department
119 Windsor Street
Cambridge, MA 02139

Cambridge Historical Commission
831 Massachusetts Avenue, 2nd Floor
Cambridge, MA 02139

Cambridge Department of Public Works
147 Hampshire Street
Cambridge, MA 02139

Cambridge Police Department
5 Western Avenue
Cambridge, MA 02139

Emergency Management Division
Boston Fire Department
115 Southampton Street
Boston, MA 02118

Cambridge Emergency Management Division
147 Hampshire Street
Cambridge, MA 02139

City Manager Cambridge City Hall
795 Massachusetts Avenue
Cambridge, MA 02139

Cambridge Water Department
250 Fresh Pond Parkway
Cambridge, MA 02138

Cambridge City Council
City Hall, 2nd Floor
795 Massachusetts Avenue
Cambridge, MA 02139

Cambridge Fire Department
491 Broadway
Cambridge, MA 02138

The State Library of Massachusetts
Government Documents Librarian State House, Room 341
Boston, MA 02133

Boston Public Library West End Branch
151 Cambridge Street
Boston, MA 02114

Boston Public Library Government Documents Department
700 Boylston Street
Boston, MA 02116

Cambridge Public Library Central Square Branch
45 Pearl Street
Cambridge, MA 02139

Senator Sal N. DiDomenico
Massachusetts State House
Room 218
Boston, MA 02133

Senator Anthony Petruccelli
Massachusetts State House
Room 413B
Boston, MA 02133

Representative Michael Moran
Massachusetts State House
Room 443
Boston, MA 02133

Representative Kevin Honan
Massachusetts State House
Room 38
Boston, MA 02133

Representative Alice Wolf
Massachusetts State House
Room 167
Boston, MA 02133

Harvard University
Transportation Planning
Holyoke Center, Suite #901
1350 Mass. Ave
Cambridge, MA 02138

Boston University
Jim Shaer, Director of State Relations
121 Bay State Rd.
Boston, MA 02215

Massachusetts Institute of Technology
Kelley Brown, Senior Campus Planner
77 Massachusetts Avenue
Cambridge, MA 02139

Harvard and Cambridge Boat Club
Linda Muri
195 Maplewood ST
Watertown MA 02472

Freshman Lightweight Men's Coach
Murr Center
65 North Harvard Street
Boston, MA 02163

Watertown Yacht Club
Ralph Levy
25 Crescent St #425
Waltham, MA 02453

Watertown Yacht Club
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Waltham, MA 02453

Harvard and Cambridge Boat Club
Linda Muri
195 Maplewood St.
Watertown MA 02472

Freshman Lightweight Men's Coach
Murr Center
65 North Harvard Street
Boston, MA 02163

Charles River Watershed Association
190 Park Road
Weston, MA 02493

Charles River Conservancy
4 Brattle Street
Cambridge, MA 02138

MassBike
171 Milk Street, Suite 33
Boston, MA 02109

A Better City
33 Broad Street, Suite 300
Boston, MA 02109

Walk Boston
Old City Hall
45 School Street
Boston, MA 02108

Livable Streets Alliance
70 Pacific Street
Cambridge, MA 02139

Boston Commission for Persons with Disabilities
Boston City Hall
1 City Hall Plaza, Room 966
Boston, MA 02201

Cambridge Disabilities Commission
51 Inman Street, 2nd Floor
Cambridge, MA 02139

Harry Mattison
Allston Brighton North Neighbors Forum
28 Mansfield St,
Allston, MA 02134

Cambridgeport Neighborhood Association
Bill August
101 Arch Street, Suite 900
Boston, MA 02110-1112

ATTACHMENT 5

Bridge Rehabilitation Recommendation Memorandum

Rehabilitation of the Anderson Memorial Bridge
Bridge No. B-16-011=C-01-007
North Harvard Street over Charles River
Boston - Cambridge
MassDOT Project No. 605517

Bridge Rehabilitation Recommendation Memorandum

Prepared for:

Moving Massachusetts Forward. massDOT Highway

Massachusetts Department of Transportation (MassDOT)
Highway Division
Ten Park Plaza
Boston, MA 02116

Prepared by:

ENGINEERS FST Since 1914

Fay, Spofford & Thorndike
5 Burlington Woods
Burlington, MA 01803

May 20, 2010

Table of Contents

1.0 INTRODUCTION

1.1 Objective

The objective of this memorandum is to summarize the investigated rehabilitation alternatives for the Anderson Memorial Bridge and to recommend a preferred alternative.

This memorandum is in part founded on the information provided in the *Condition Inspection Report* that was submitted under separate cover on May 16, 2010. The Condition Inspection Report is considered a part of this document by reference.

1.2 Project Location

Built in 1913, The Anderson Memorial Bridge (Bridge B-16-011 = C-010-007) is a three-span concrete arch bridge that carries North Harvard Street over the Charles River in Boston and Cambridge, Massachusetts. The bridge is a vital transportation link between Boston and Cambridge that accommodates significant volumes of vehicular, pedestrian and bicycle traffic. The bridge also serves as the primary connection between the two Harvard Campuses and their athletic fields; a fact that is clearly expressed on the original bridge plans which refer to the structure as the *Stadium Bridge over the Charles River*.

The bridge is classified as an Urban Arterial and is listed on the State and National Registers of Historic Places as an integral and contributing component of the historic Charles River Basin (see figure 1 in Appendix A for the Locus Plan).

1.3 General Description of Bridge

The three-span concrete arch bridge measures 232 feet between abutments and has an overall length of 410 feet, inclusive of the retained fill approaches. The total width of the bridge is 64 feet, which is comprised of four 10-foot travel lanes for a total roadway width of 40 feet curb-to-curb, plus a 10-foot wide sidewalk and a 2-foot wide parapet on each side of the bridge (see figures 2 and 3).

The superstructure consists of three reinforced concrete arches with brick arch-rings at the fascias. Each arch is a circular-arc segment with a constant radius and variable thickness. The clear span of the exterior arches is 65'-4". The exterior arches vary in thickness from 16 inches at the crown to 5'-4" at the spring line.

The clear span of the center arch is 76'-8", with a thickness varying from 18 inches at the crown to 6'-7" at the spring line/pier interface.

The brick voussoirs (brick arch-rings) are present along both edges of the arch. These arch-rings match the inside radius of the arch and define the edge of the arch in elevation. The concrete spandrel walls which sit atop the brick arch-rings and the concrete arches, have exposed aggregate concrete with bands of in laid brick and cast stone cladding.

Concrete arch, brick arch ring and spandrel walls

The abutments and piers are comprised of massive concrete footings founded on tightly spaced timber piles. The wingwalls and stairway on the Cambridge approach are also founded on timber piles, while the wingwalls on the Boston approach are on spread footings. The wingwalls are concrete gravity type walls.

2.0 EXISTING CONDITIONS

In September and October of 2009, FST performed a visual conditions survey of the existing structure. Based on the conditions survey, the concrete deficiencies were indentified and mapped (see figures 4, 5 and 6).

In the *Condition Inspection Report*, submitted on May 16, 2009, the results of the visual conditions survey for each component of the bridge are discussed in detail. The following is a brief summary of the findings from the report.

Table 1 – Condition Ratings of the Main Bridge Components

Bridge Component	Condition	Comments
Roadway wearing surface	Satisfactory	---
Sidewalks	Satisfactory	---
Arch Ring	Poor	The condition of the brick has degraded to a point that protective netting was placed beneath the brick arch ring as a safeguard against the potential for falling brick. Separation between the arch and arch-ring was noted at several locations.
Concrete Arches	Fair to Satisfactory	See table below for a summary of concrete deterioration on the underside of the arches.
Parapets	Poor	---
Spandrel Walls	Poor	---
Piers & Abutments	Satisfactory	---
Wingwalls	Fair	The report noted possible vertical settlement cracks and moderate cracking throughout.
Stairway	Poor	---
Underwater Inspection of Piers	Good	No significant change in channel-bed elevations.
Underwater Inspection of Abutments	Satisfactory	No significant change in channel-bed elevations.

The following table provides a summary of the concrete deterioration indentified on the underside of the concrete arches.

Table 2 - Approximate Deterioration Quantities at the Underside of Each Arch *

Arch	Total Surface Area (Underside of Arch)	Cracks **	Spalls with Exposed Steel	Hollow Sounding Areas
North Arch	5800 SF	800 LF	35 SF (<1%)	100 SF (2%)
Center Arch	6500 SF	600 LF	50 SF (<1%)	90 SF (2%)
South Arch	5800 SF	300 LF	150 SF (3%)	600 SF (10%)
Total	18,100 SF	1,700 LF	235 SF (1%)	790 SF (<5%)

** These quantities represent the deterioration noted during the Oct. 2009 hands-on inspection and are not intended to represent final estimated repair quantities.*
*** The crack quantities presented in the table do not include the full length cracks at the interface between the concrete arch and the brick arch-rings.*

3.0 MATERIAL TESTING

3.1 Sampling and Testing Program

As part of the condition survey of the Anderson Memorial Bridge, a material testing program was conducted. The purpose of the material testing was to assess the quality of the concrete and to determine its' chemical and physical properties. The testing program included the following:

- Thirty (30) cores were taken at the following bridge elements:
  - 23 cores from the arches
  - 4 cores from the wingwalls
  - 3 core for the spandrel wall
- Twelve (12) petrographic examinations
- Twelve (12) compressive strength tests
- Twelve (12) of the cores were tested for chloride-ion content at various depths from the surface resulting in a total of fifty-nine (59) chloride-ion content tests
- Three (3) half-cell potential tests were conducted

Note: Of the 30 cores, 14 were taken as part of this contract (10 from the arches and 4 from the wingwalls) and 16 cores were taken during the preliminary investigation (13 from the arches, 3 from the spandrel walls).

The results of the material sampling and testing are presented and discussed in detail in the Condition Inspection Report. The testing was primarily focused on the concrete arches, since the deficiencies in the spandrel walls, brick arch-ring, parapets and wing walls are so extensive that rehabilitation of these elements can be dismissed.

3.2 Concrete Quality

The material sampling and testing of the concrete indicated the following with respect to the quality of the concrete, the extent of the chloride contamination and the presence of material deficiencies:

- Alkali-Silica Aggregate Reactivity (ASR) – Seven (7) of the 12 samples examined had no signs of ASR; four were classified as either 'minor' or 'potential' ASR

presence and; one sample was classified as 'moderate' (core CP1)[1]. In summary, the testing indicates that there is no indication of a systemic ASR problem in the arches.

- Freeze Thaw - The petrographic examination of the 12 samples did not reveal systemic distress related to freeze-thaw damage.
- Chloride-Ion Content
  - Six of the 12 cores tested for chloride contamination had levels less than the 1.25 lbs/cy threshold.
  - The other six cores had at least one section with levels greater than the 1.25 lbs/cy threshold.
    - At two of these 6 locations, the levels were acceptable around the main reinforcing, but had slightly elevated levels (1.49 and 1.61) at mid-depth of the arch.
    - With respect to the remaining 4 cores with elevated levels in the vicinity of the top or bottom layer of reinforcing (between 2.23 and 4.70 lbs/cy), there appears to be a correlation between the high levels of chlorides and the presence of consolidation voids in the concrete.
  - Only 2 of the 12 cores tested had levels above 2.25 lbs/cy. These two cores were taken at spring line and in areas with water infiltration. C7 is adjacent to previously repaired longitudinal cracks and water poured out of the C11 core during the drilling operation near mid-depth of the arch.
  - In summary, in the large areas where the concrete is sound, the chloride-ion content is generally low.

3.3 Concrete Strength

Eight concrete samples, taken at both the spring line and crown of all three arches, were tested to determine the compressive strength of the concrete. The resultant average compressive strength is approximately 7,600 psi, with a minimum compressive strength of 5,410 psi. Based on these results, the concrete in the arches have sufficient strength to support the proposed loads. In addition, the relatively high compressive strength in the concrete is usually an indication of good quality concrete.

The as-tested Modulus of Elasticity at 8 of the 12 samples is more than 10% below the theoretical value (10% is considered a normal deviation below the theoretical value). The average for the 8 samples with lower than expected moduli, is 23% below

[1] Core CP1 exhibited signs indicative of a 'moderate' level of ASR with 'cracked aggregates with gel emanating into the paste'. The Petrographic Examination also noted evidence indicative of 'repeated ingress of water during service'. Even with conditions that were conducive for ASR damage that included many years of water infiltration, the concrete examined at core CP1 had only a moderate level of ASR present.

theoretical. Low moduli can be an indication of the possible presence of a deterioration mechanism within the concrete.

3.4 Summary of Testing Program

In summary, it is our opinion that the deterioration present in the concrete arches can be successfully repaired to provide a structure with a 40 to 50 year service life. This recommendation is founded on the fact that there are no systemic deterioration mechanisms (such as ASR, freeze thaw damage or corrosion damage) prevalent in the concrete and that the in situ concrete has a relatively high compressive strength (an avg. of 7,600 psi) that is well in excess of the stress demands on the arch.

The limited signs of deterioration mechanisms that were identified in the petrographic examinations were isolated and have not caused any significant damage. We also noted that a lot of the concrete deterioration coincides with areas containing consolidation voids, lack of proper mixing and aggregate segregation. These initial construction defects created local environments that after many years have manifested into hollow sounding areas, corrosion and spalls. Proper repair of these defects, coupled with a new waterproofing membrane to keep water out of the concrete can effectively achieve a structure with a 40 to 50 year service life.

4.0 PRELIMINARY STRUCTURAL EVALUATION

The existing arches were analyzed using a 3-D finite element model of all three spans. In addition to the final loading condition, the temporary loading conditions to assess staged construction effects were analyzed.

The results indicated that the existing concrete arches have sufficient capacity to support statutory loading and that the proposed staged construction scheme can be accomplished without adversely impacting the arch.

5.0 GEOTECHNICAL EVALUATION

A Geotechnical Memorandum will be submitted under separate cover. There are no new borings anticipated for the bridge rehabilitation at this time. The total load on the substructure is within 5% of the existing load and there are no significant defects in the piers or abutments.

A subsurface profile based on the borings shown on the original bridge drawings is provided herein (see figure 13 in Appendix A).

6.0 HYDRAULIC EVALUATION

As part of this contract, Survey Mapping Consultants conducted a bathymetric survey of the bottom of the Charles River in the vicinity of the bridge in 2009. This information was utilized to update a Scour Evaluation that was performed for the Anderson Memorial Bridge in 2004 by Simpson Gumpertz & Heger (SGH) for the Department of Conservation of Recreation. Based on review of the bathymetric survey, there are no significant changes in the river-bed elevations or river-bank conditions over the last 5 years. In addition, the current river-bottom conditions do not differ significantly from the conditions shown on the original 1912 bridge construction plans.

In summary, the bridge is not scour critical and the bridge will remain stable under potential scour-effects from either a 100-year or a 500-year flood. The results of the updated scour evaluation will be submitted under separate cover.

The proposed rehabilitation will not alter the existing hydraulic opening.

7.0 UTILITIES

The following is a preliminary listing of the existing utilities on the bridge and the approaches:

Utilities on the Bridge:

- Telephone Conduit - under west sidewalk
- MBTA 26" x 25" duct bank - under east sidewalk
- Two 30" MWRA Water Main – one under each sidewalk
- Electric Conduits (Street Lighting) - under east & west sidewalks
- 1" Electric Conduits (Navigational Lights on Bridge) - outside parapet east & west side of bridge

Utilities off the bridge on the Cambridge Approach:

- 48" MWRA Water Main - under roadway
- Traffic Signal Conduit - under sidewalks and roadway

Utilities off the bridge on the Boston Approach:

- 36" MWRA Water Main - under roadway
- Traffic Signal Conduit - under sidewalks and roadway

8.0 RIGHT OF WAY

All properties that would be impacted by the proposed bridge rehabilitation on both sides of the Charles River are owned and managed by the Massachusetts Department of Conservation and Recreation (DCR). This includes the parcel where the Weld Boathouse is located, which is under a lease agreement with the Commonwealth of Massachusetts.

9.0 ALTERNATIVES

9.1 Description of Alternatives

A series of work sessions to identify and evaluate rehabilitation alternatives for the bridge were held between FST and the DCR prior to the transfer of the project to MassDOT. These work sessions resulted in a decision to investigate the following three alternatives.

Alternative 1 – Rehabilitate the Existing Concrete Arches (see figure 8)
Alternative 2 – New Concrete Arches (see figure 9)
Alternative 3 – New Box Beam Superstructure over Existing Arches (see figure 10)

A detailed evaluation of these alternatives was performed. The evaluation included the assessment of the major project issues including: cost, schedule, service life, maintenance, roadway profile, utilities and risk factors, such as historic review and compliance. The results of the evaluation are summarized and presented in the design matrix table on the following pages.

Table 3 – Rehabilitation Alternatives Matrix

Ref. No.	Criteria / Factor	Alternative 1 Rehabilitate Arches	Alternative 2 New Concrete Arches	Alternative 3 New Box Beam Superstructure over Existing Arches
1	Typical Section	See figure 8	See figure 9	See figure 10
2	Estimated Costs: ▪ Construction Cost ▪ 20% Contingency ▪ 5% Admin ▪ Estimated Project Cost *Escalation assumed to be 2.5%/year	$18,000,000 $3,600,000 $900,000 $22,500,000	$27,900,000 $5,600,000 $1,400,000 $34,900,000	$21,800,000 $4,400,000 $1,100,000 $27,300,000
3	Estimated Structure Life	Estimated 40 to 50 years	75 years	75 years (new superstructure) Estimated 40 to 50 years (existing arches)
4	Schedule: Design (time required to complete design from June 1, 2010)	10 months	16 months (due to need for boring program, Chap. 91 and additional coordination w/U.S.C.G. may be required due to demolition of arches)	14 months (Issues anticipated with the historic review. The greater the deviation from the original design, the longer and more arduous the process is likely to be.)
	Construction Duration	30 months	36 months	30 months
	Total Project Duration	40 months	52 months	44 months
Major Risk Factors:				
5	Service Life	**Moderate to Significant** ▪ The existing arches will require concrete repair to provide a 40 to 50 year service life ▪ Risk associated w/repair quantity increases during construction may result in additional costs and construction delays. ▪ May require future concrete repairs to address deterioration that has not yet manifested. ▪ Possible measures to increase service life: ▫ Composite topping on arch (prior to waterproofing) to provide second level of protection against water infiltration. ▫ Corrosion mitigation techniques. Consider the use of corrosion mitigating measures, such as: galvanic protection, cathodic protection and/or corrosion inhibitors. These proactive measures can be cost effective ways to increase the life of the concrete repairs and the structure as a whole.	**Minor** ▪ Use of new arches will minimize risk by eliminating the existing arches completely. ▪ There is some risk associated with the modifications to the existing piers and abutments to receive the new arches.	**Moderate to Significant** ▪ This option still relies upon the existing arches as part of final structure (albeit in a non-traffic supporting role). The risks associated with repair quantities and the need for future concrete repairs apply to this Alternative as well. ▪ Adjacent box beam construction has not performed well and many bridges of this type have had a relatively short service life. ▪ Adjacent boxes with a 5" composite topping slab has only been used in MA since 2006 and has a limited history by which to gage its' success.

Table 3 – Rehabilitation Alternatives Matrix - continued

Ref. No.	Criteria / Factor	Alternative 1 Rehabilitate Arches	Alternative 2 New Concrete Arches	Alternative 3 New Box Beam Superstructure over Existing Arches
6	Historic Review and Compliance	**Minimal** ▪ Least amount of risk, since this alternative maximizes the amount of original bridge components retained.	**Minimal to Moderate** ▪ Risk should be minimal since the function and appearance of the original design would be maintained.	**Potentially Significant** ▪ This represents a change in function of the arches and may be perceived to substantially alter the historic fabric of the bridge. *Note: If a major functional change is warranted it is generally considered preferable to replace the bridge using present day construction materials & technology.*
7	Future Maintenance	**Moderate** ▪ Concrete arch maintenance may be required over the service life of the structure.	**Minimal** ▪ New precast arches should require minimal maintenance over the service life of the structure.	**Moderate to Significant** ▪ Concrete arch maintenance may be required over the service life of the structure. ▪ Limited access for inspection of adjacent box beams at crown will be an issue (2'-3" minimum clearance is typically required for inspection access). ▪ Bridge deck joints (6 total) and longitudinal joints at back of sidewalk may be a maintenance issue. ▪ Access hatches will require maintenance and the void below the deck may constitute a confined space.
8	Roadway Issues	**Minimal** ▪ Maintaining waterline in the current position (which is located above a recess in the arch) limits the flexibility with the roadway reconfiguration.	**Minimal** ▪ New arches will enable the waterlines to be repositioned to suit potential roadway improvements.	**Moderate** ▪ Adjacent box construction will require a 5" composite topping slab and a profile rise of approx. 1-foot at the crown. This will worsen the already challenging profile with respect to sight distances.
9	Structural Issues	▪ Arches in Fair to Satisfactory Condition with concrete deterioration identified during inspection. Preventing water infiltration is critical to successfully inhabiting the corrosion of the reinforcing steel and further concrete deterioration. ▪ In-situ concrete strength is sufficient for the proposed loads. ▪ Petrographic testing did not reveal any systemic material problems in the concrete.	▪ Constructability – need to investigate the use of a two-piece precast arches vs. CIP concrete arches. The size of a single piece arch segment is prohibitive and it is unlikely it can be delivered and installed as one piece.	▪ See Alternative 1 for discussion on retaining the existing arches. ▪ Unloading the arches (permanent removal of fill) creates stress redistribution in arches that could initiate new cracking. ▪ MassDOT Bridge Manual now requires composite concrete topping slab for adjacent box beam construction. Use of adjacent box beams (without topping slab) used to be limited to bridges with max. ADT's of 5,000. The Anderson has an ADT of 29,000.
10	Substructure Issues	**Minor** ▪ The rehabilitated bridge will not require major substructure work for the bridge. ▪ Wingwalls will be replaced.	**Moderate** ▪ New arches (w/same profile as existing) will require modifications to the piers/abutments to create seats for the new arches. ▪ Wingwalls will be replaced.	**Moderate** ▪ Casting new piers and abutment stems directly on the existing piers will require modifications to the piers/abutments to receive the new footings. ▪ Wingwalls will be replaced.
11	Impact on Utilities	**Minor** ▪ Utilities can be temporarily supported or relocated during construction.	**Major** ▪ Utilities will need to be temporarily supported, without the benefit of the existing arches and relocated to accommodate arch installation.	**Moderate** ▪ Utilities will need to be temporarily supported and relocated to accommodate new bridge superstructure.

9.2 Construction Staging

The rehabilitation will require staged construction. It has been assumed that two travel lanes (one lane in each direction) plus one sidewalk will be maintained throughout construction. It is also assumed that only one of the three arch barrels in the river can be blocked at a time due to the need to maintain two navigable openings for boat use at all times.

For the rehabilitation schemes where the concrete arches will be retained, we recommend that the waterproofing be replaced over the entire width of the arch. This recommendation is based on the inspection results, which indicated that at least locally, the waterproofing is compromised and the drainage system over the piers is not functional and must be replaced. The need to excavate and expose the topside of the arches and piers will require three major construction stages.

One method that has been considered is the construction of a flowable fill/lean concrete mix Support of Excavation (SOE) wall in a center trench during stage 1. The SOE wall would then be utilized as a gravity retaining wall in stages 2 and 3. Schematic drawings for this staging scheme are provided herein as figures 11 and 12. This concept is provided to depict a workable scheme and to confirm that the bridge rehabilitation can be accomplished via staged construction. Other staging schemes will be investigated as part of final design.

It should be noted that the conceptual staging scheme provided is based on Alternative 1. The scheme is workable for Alternative 3; however, it will require additional sub stages to construct new solid wall piers and abutments to support the new box beam superstructure.

With respect to Alternative 2, which calls for new precast concrete arches, the staging requirements will be more complex due to requirements related to the excavation and demolition sequencing of the existing arches. Alternative 2 will also require significantly more in-water work to facilitate the demolition of the existing arches, preparation of the piers to receive the new arches and the actual installation of the new precast segments. This will complicate the staging due to the requirement that only one arch barrel can be occupied at a time.

9.2 Preliminary Construction Cost Estimate

The following is the estimated construction cost for the 3 alternatives considered.

Table 4 – Estimated Construction Costs

	Alternative 1 Rehabilitate the Existing Concrete Arches	Alternative 2 New Concrete Arches	Alternative 3 New Box Beam Superstructure over Existing Arches
Estimated Construction Cost	$18,000,000	$27,900,000	$21,800,000
20% Contingency	$3,600,000	$5,600,000	$4,400,000
Total Construction Cost	$21,600,000	$33,500,000	$26,200,000

10.0 RECOMMENDATION

The condition assessment and the material testing indicated that the existing arches could be rehabilitated and retained as part of the final rehabilitated bridge. This coupled with the schedule and cost benefits associated with Alternative 1 - Rehabilitate Existing Arches, makes this the preferred alternative. The rehabilitation scheme will provide a 40 to 50 year rehabilitation, which could be extended with proper inspection and maintenance.

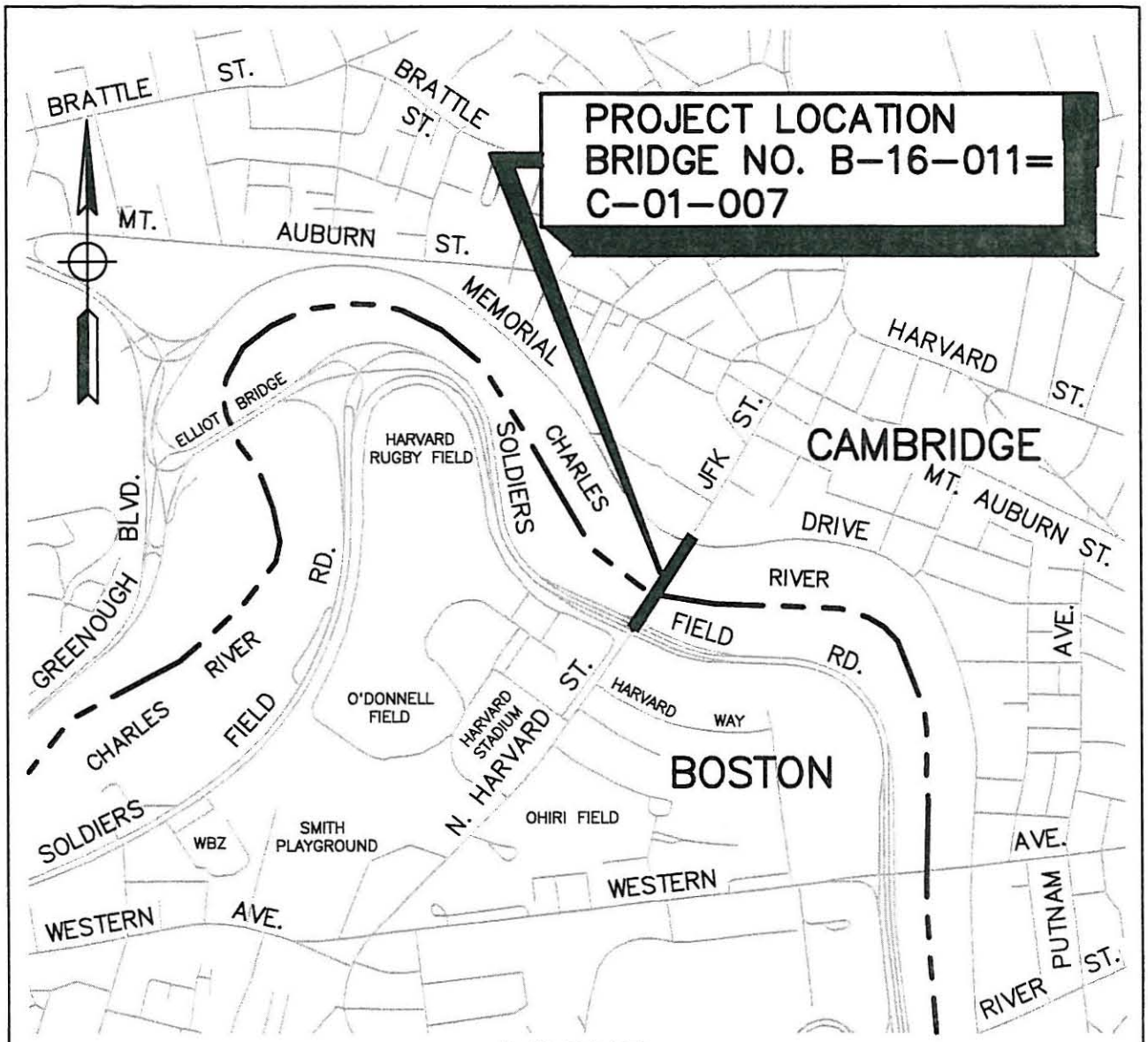
Implementing Alternative 2 would result in a significant increase in the project cost and would delay project completion by an estimated 12 months.

Alternative 3 requires that the existing arches be rehabilitated and retained as self-supporting elements within the rehabilitated structure. This negates some of the benefits associated with a new superstructure. In addition, this alternative relies on the use of box beam construction in an environment that would have inspection access issues and maintenance concerns. Based on these concerns and the additional cost as compared to Alternative 1, this alternative is not recommended.

In summary, we recommend Alternative 1 – Rehabilitate Existing Arches.

APPENDIX A – FIGURES

INDEX



LOCUS

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SCALE IN FEET

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massDOT
Highway

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CONDITION INSPECTION REPORT

LOCUS PLAN

MAY 2010 | FIGURE NO. 1

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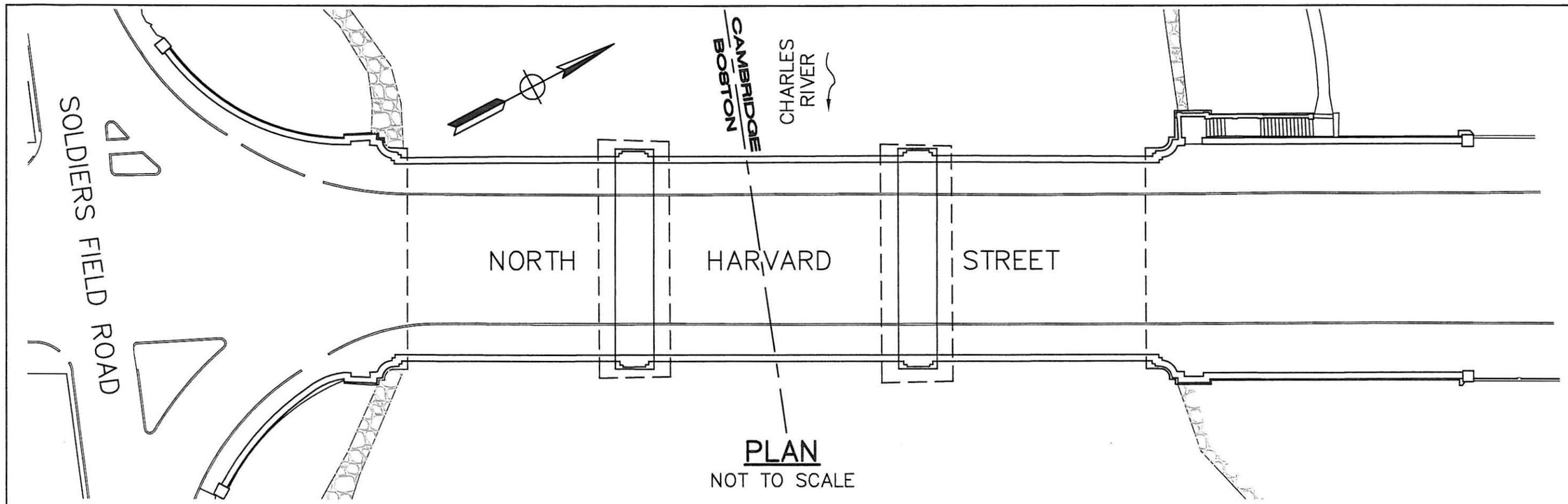
5 BURLINGTON WOODS
BURLINGTON, MA 01803



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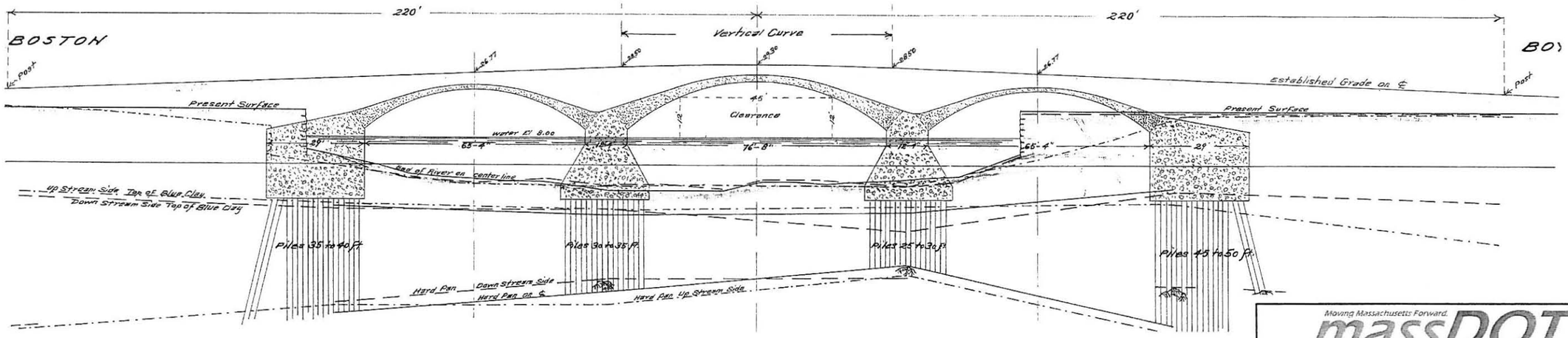

LONGITUDINAL SECTION
NOT TO SCALE

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CONDITION INSPECTION REPORT
EXISTING PLAN AND LONGITUDINAL SECTION

MAY 2010 | FIGURE NO. 2

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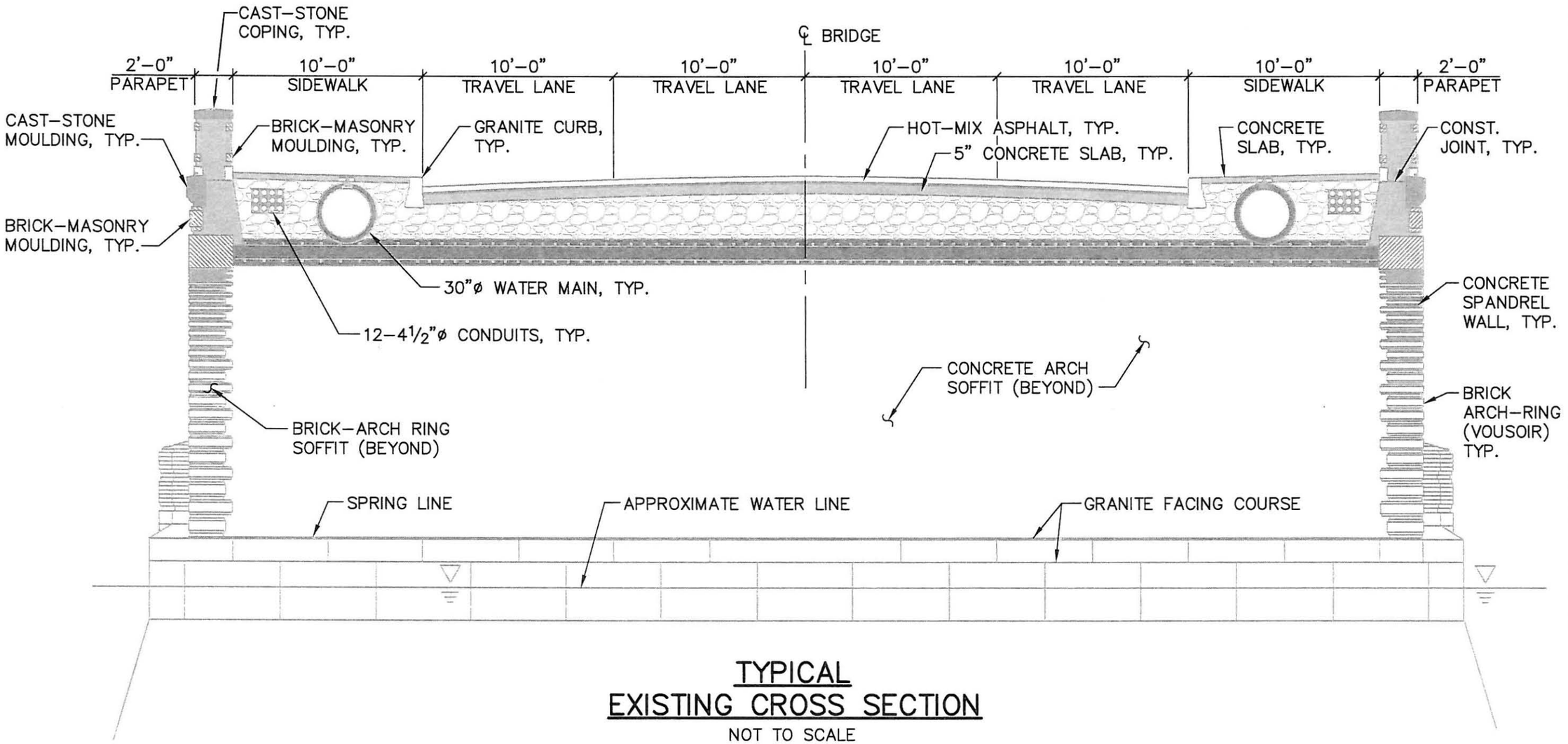
BURLINGTON, MA 01803



TYPICAL EXISTING CROSS SECTION

NOT TO SCALE

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TYPICAL EXISTING CROSS SECTION

MAY 2010 | FIGURE NO. 3

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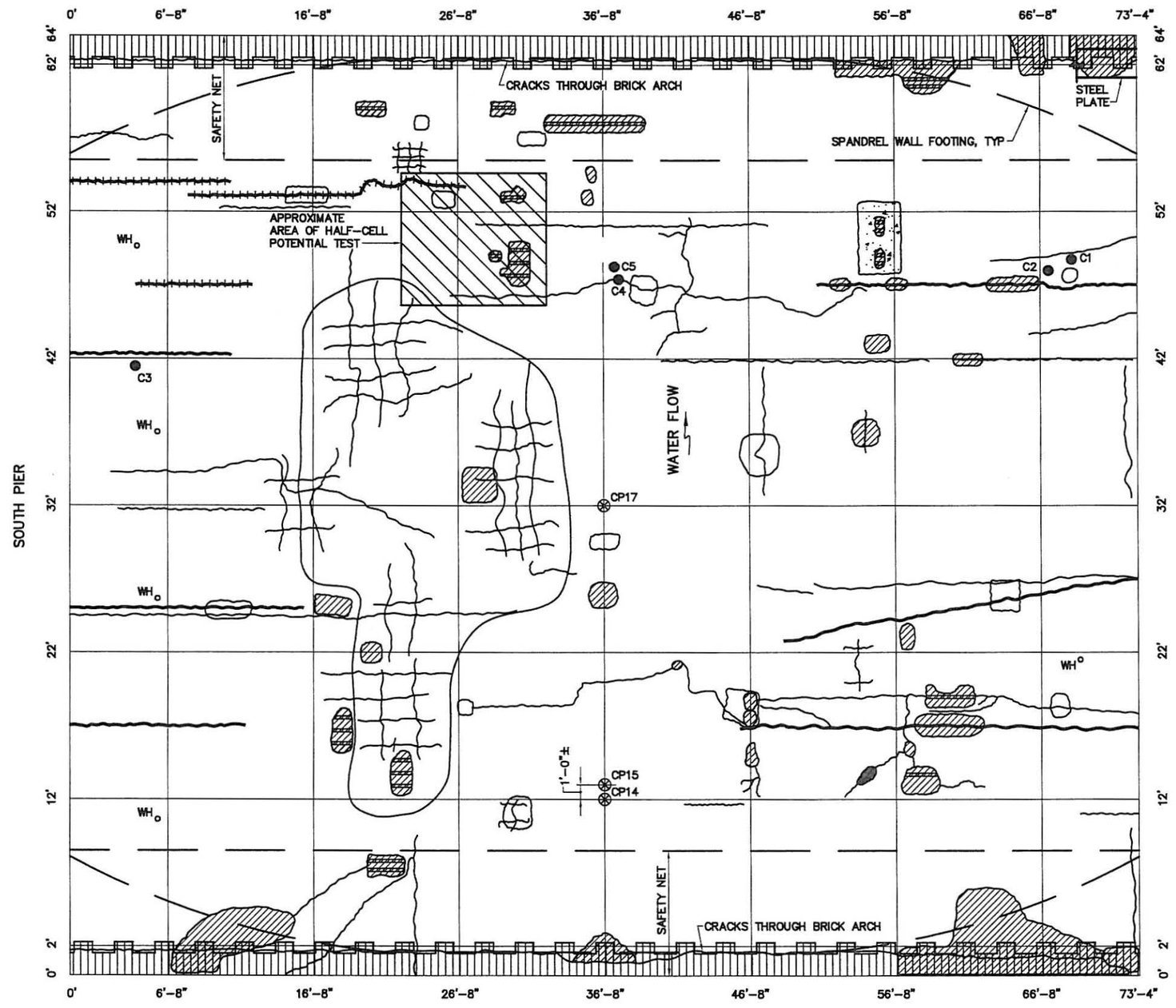
BURLINGTON, MA 01803



SOUTH ARCH – REFLECTED PLAN

SCALE: AS NOTED

LEGEND:

- CRACK
- CRACK W/EFFLORESCENCE
- EPOXY CRACK
- EPOXY CRACK W/EFFLORESCENCE
- BRICK ARCH
- LOOSE CONC. REPAIR
- HOLLOW SOUND
- SPALL
- SPALL W/EXPOSED REINFORCING
- WOOD
- WET SPOT
- RUST STAIN
- C1 CORE
- CP2 PREVIOUSLY DRILLED CORE (IN 2009)
- IP INJECTION PORT
- WH WEEP HOLE

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SOUTH ARCH REFLECTED PLAN

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BURLINGTON, MA 01803

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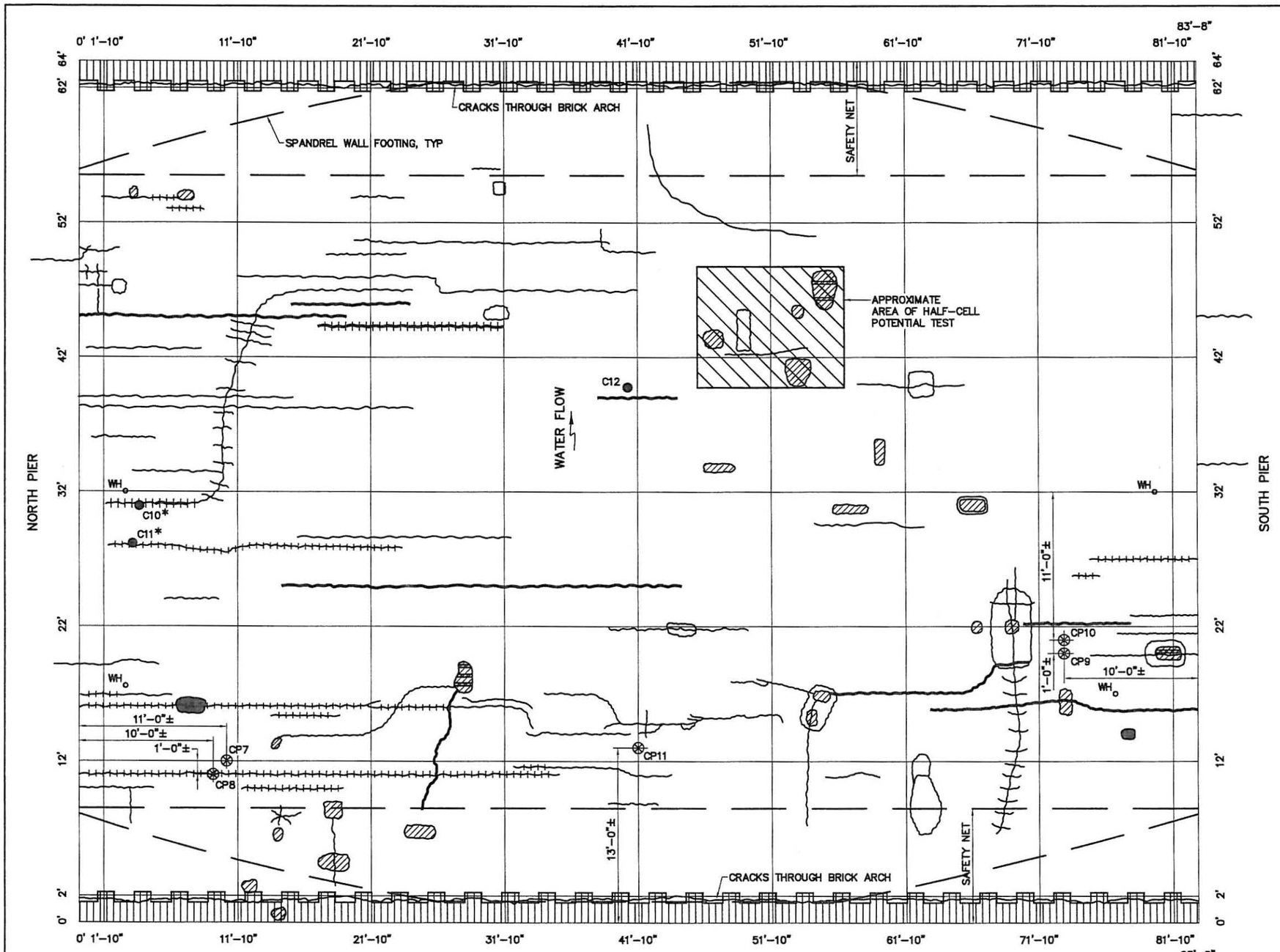

CENTER ARCH – REFLECTED PLAN

SCALE: AS NOTED

LEGEND:

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- CRACK W/EFFLORESCENCE
- EPOXY CRACK
- EPOXY CRACK W/EFFLORESCENCE
- BRICK ARCH
- LOOSE CONC. REPAIR
- HOLLOW SOUND
- SPALL
- SPALL W/EXPOSED REINFORCING
- WOOD
- WET SPOT
- RUST STAIN
- C1 CORE
- CP2 PREVIOUSLY DRILLED CORE (IN 2009)
- IP INJECTION PORT
- WH WEEP HOLE

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CENTER ARCH REFLECTED PLAN

MAY 2010 | FIGURE NO. 5

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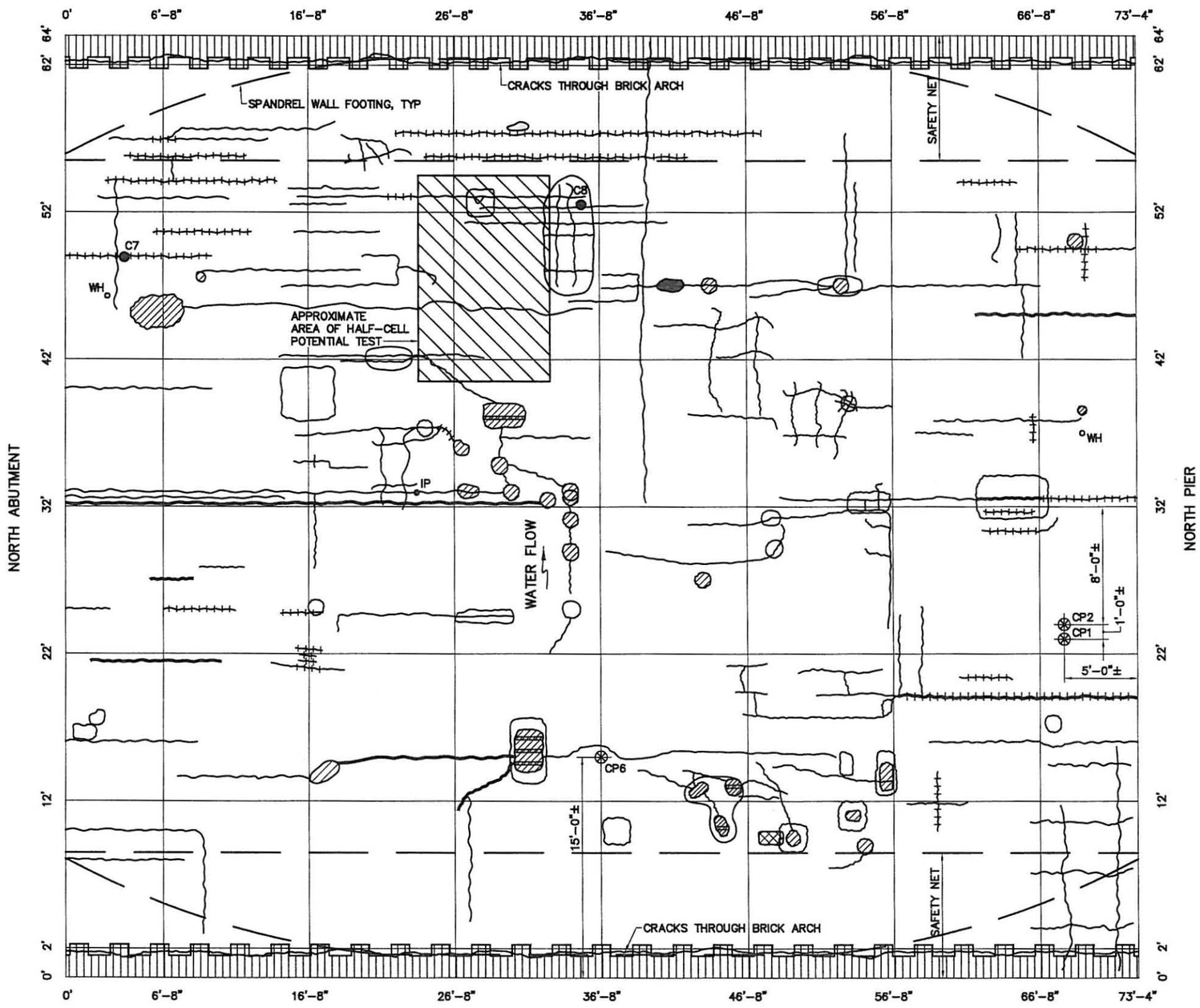

NORTH ARCH – REFLECTED PLAN

SCALE: AS NOTED

LEGEND:

- CRACK
- CRACK W/EFFLORESCENCE
- EPOXY CRACK
- EPOXY CRACK W/EFFLORESCENCE
- BRICK ARCH
- LOOSE CONC. REPAIR
- HOLLOW SOUND
- SPALL
- SPALL W/EXPOSED REINFORCING
- WOOD
- WET SPOT
- RUST STAIN
- C1 — CORE
- CP2 — PREVIOUSLY DRILLED CORE (IN 2009)
- IP — INJECTION PORT
- WH — WEEP HOLE

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NORTH ARCH REFLECTED PLAN

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CONCRETE CORE SUMMARY TABLE – SOUTH ARCH

CORE NO.	ARCH THICKNESS (IN.)	CORE DEPTH (IN.)	NO. OF PIECES	COMPRESSIVE STRENGTH (IN.)	MODULUS OF ELASTICITY TESTED (KSI)	MODULUS OF ELASTICITY CALCULATED (KSI)	CHLORIDE ION CONTENT (LBS./CU. YD.)			PETROGRAPHIC EXAMINATION			
							BOTTOM	MIDDLE	TOP	ASR	FREEZE/THAW DAMAGE	CARBONATION	SULFATE ATTACH
C1	51	51 1/8	11	–	–	–	1.14	1.49	1.17	NONE OBSERVED	NONE OBSERVED	(B)	NONE OBSERVED
C2	46	11	2	7270	4250	4860	–	–	–	–	–	–	–
C3	50	31	3	7270	4850	4860	–	–	–	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED
C4	16	13	2	–	–	–	1.61	–	0.47	NONE OBSERVED	NONE OBSERVED	(C)	NONE OBSERVED
C5	16	12 1/2	1	8960	4080	5400	–	–	–	–	–	–	–
CP14	16	16 1/2	3	–	–	–	–	–	–	NONE OBSERVED	(A)	(D)	NONE OBSERVED
CP15	16	14	–	–	–	–	0.9	1.61	0.51	–	–	–	–
CP17	16	15	2	–	–	–	–	0.16	1.10	EVIDENCE INCONCLUSIVE	NONE OBSERVED	(E)	NONE OBSERVED

(A) EVIDENCE OF FREEZE/THAW DAMAGE OBSERVED
(B) OBSERVED ALONG THE INTERFACE BETWEEN THE MORTAR TOPPING AND THE CONCRETE
(C) OBSERVED ALONG CRACKS THAT EXTEND INTO THE SAMPLE
(D) EXTENDS FROM BOTTOM SURFACE TO 1/4 INCH
(E) EXTENDS FROM BOTTOM SURFACE TO 3/8 INCH

CONCRETE CORE SUMMARY TABLE – CENTER ARCH

CORE NO.	ARCH THICKNESS (IN.)	CORE DEPTH (IN.)	NO. OF PIECES	COMPRESSIVE STRENGTH (IN.)	MODULUS OF ELASTICITY TESTED (KSI)	MODULUS OF ELASTICITY CALCULATED (KSI)	CHLORIDE ION CONTENT (LBS./CU. YD.)			PETROGRAPHIC EXAMINATION			
							BOTTOM	MIDDLE	TOP	ASR	FREEZE/THAW DAMAGE	CARBONATION	SULFATE ATTACH
C10	60	48	7	8080	4360	5120	–	–	–	–	–	–	–
C11	62	48	7	–	–	–	3.60	1.14	0.63 2.94*	MINOR	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED
C12	18	12	2	5410	3020	4190	0.74	–	0.74	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED
CP7	40	16	–	–	–	–	0.39	0.35	0.39	–	–	–	–
CP8	42	–	–	8770	4600	5340	–	–	–	–	–	–	–
CP9	42	–	2	6200	4070	4490	–	–	–	–	–	–	–
CP10	42	17	–	–	–	–	0.47	0.35	0.43	–	–	–	–
CP11	18	6	–	–	–	–	0.63	–	0.39	–	–	–	–

*TAKEN 1/4" FROM TOP

CONCRETE CORE SUMMARY TABLE – NORTH ARCH

CORE NO.	ARCH THICKNESS (IN.)	CORE DEPTH (IN.)	NO. OF PIECES	COMPRESSIVE STRENGTH (IN.)	MODULUS OF ELASTICITY TESTED (KSI)	MODULUS OF ELASTICITY CALCULATED (KSI)	CHLORIDE ION CONTENT (LBS./CU. YD.)			PETROGRAPHIC EXAMINATION			
							BOTTOM	MIDDLE	TOP	ASR	FREEZE/THAW DAMAGE	CARBONATION	SULFATE ATTACH
C7	52	50 3/8	12	7630	4880	4980	3.56	0.82	2.25	MINOR	DAMAGE OBSERVED	NONE OBSERVED	NONE OBSERVED
C8	16	13	2	7140	3630	4820	2.23	–	1.10	MINOR	NONE OBSERVED	NONE OBSERVED	NONE OBSERVED
CP1	48	13 1/2	–	–	–	–	–	–	–	MODERATE	NONE OBSERVED	NOT DETERMINED	NOT DETERMINED
CP2	48	14	–	–	–	–	1.02	0.39	0.39	–	–	–	–
CP6	16	–	–	10240	4340	5770	–	–	–	–	–	–	–

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CONCRETE CORE SUMMARY TABLES

MAY 2010 | FIGURE NO. 7

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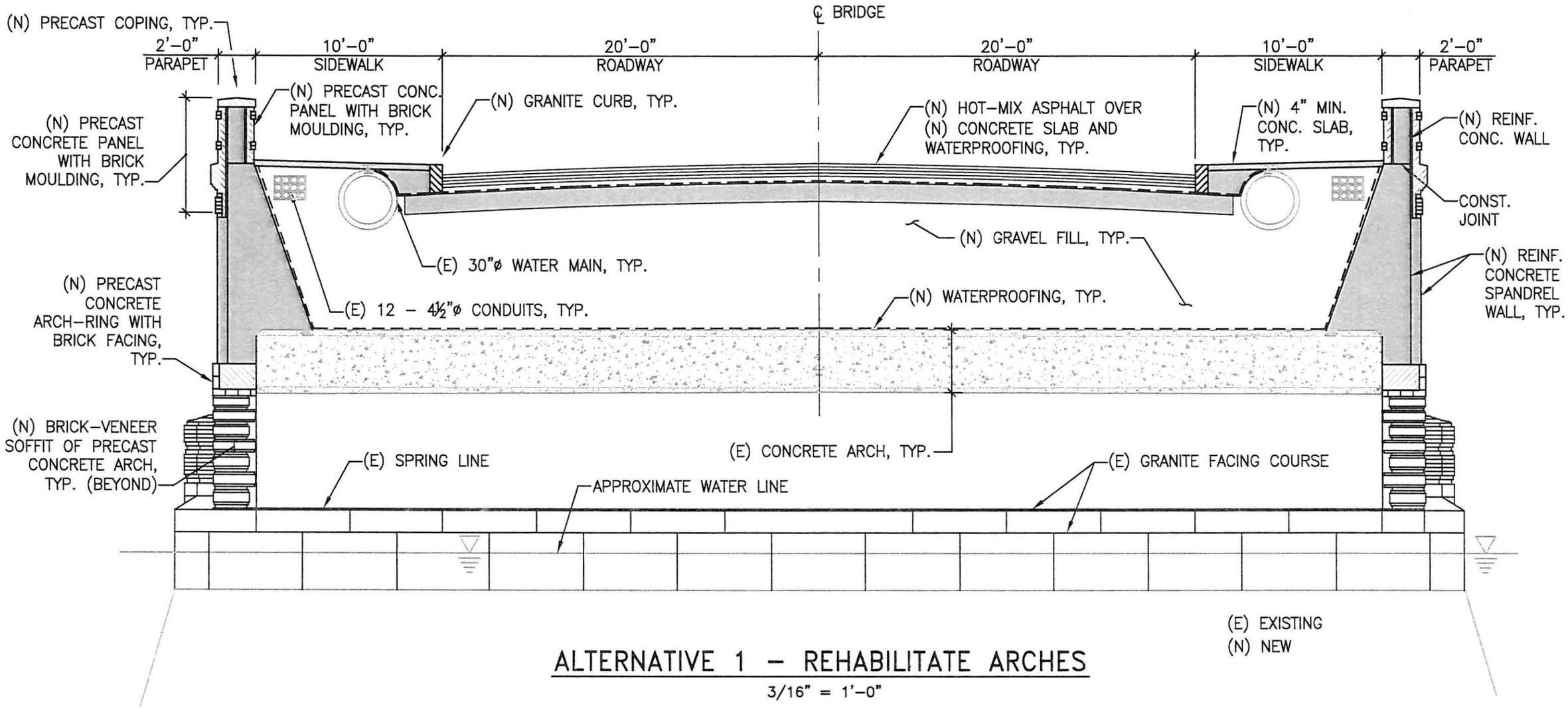
BURLINGTON, MA 01803



(E) EXISTING
(N) NEW

ALTERNATIVE 1 – REHABILITATE ARCHES

3/16" = 1'–0"

NOTE:

FINAL ROADWAY CROSS SECTION MAY DIFFER FROM THE SECTION SHOWN ABOVE BASED ON FINAL DETERMINATION OF VEHICULAR AND BIKE LANE WIDTHS REQUIRED.

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REHABILITATE ARCHES
ALTERNATIVE 1

DESIGNED:	CONTRACT NO.			FIG. NO.
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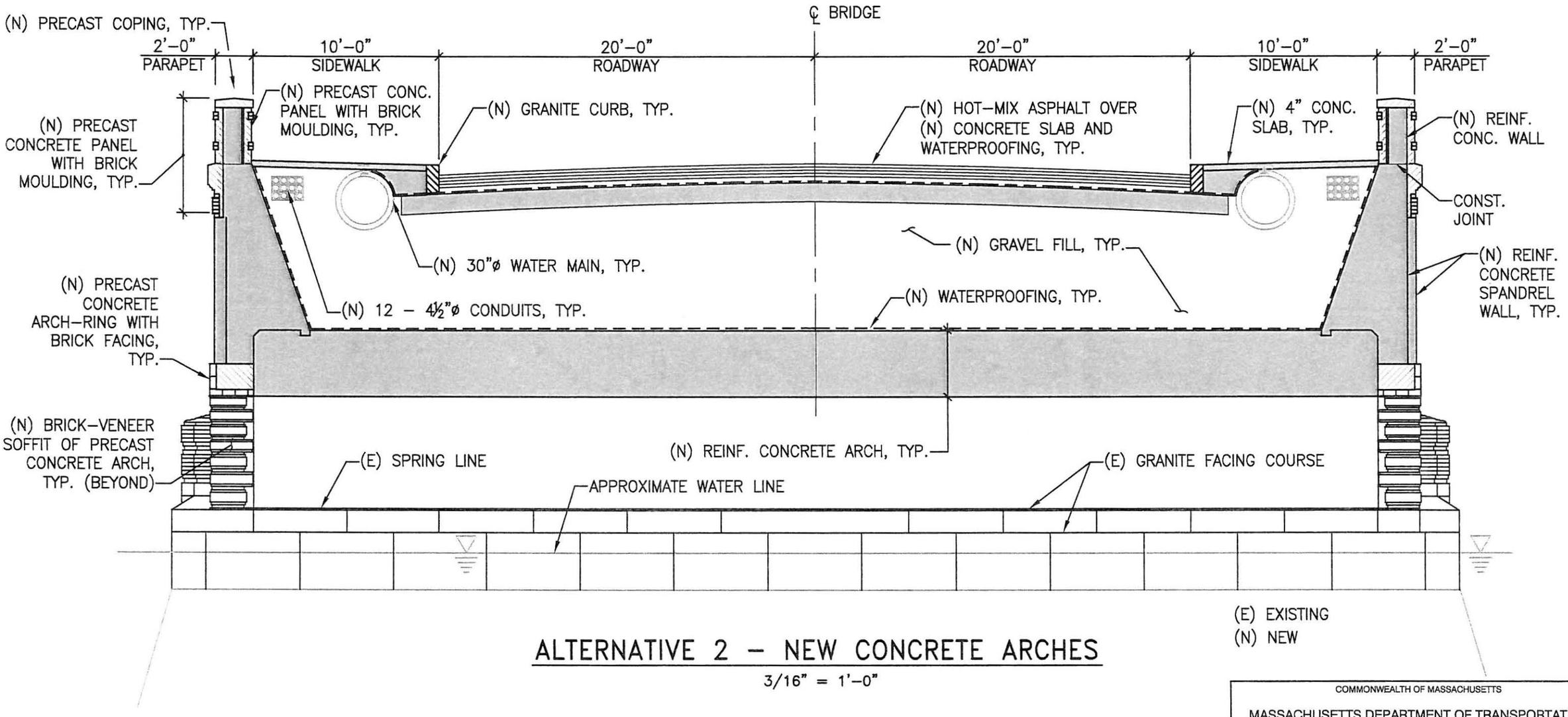

ALTERNATIVE 2 – NEW CONCRETE ARCHES

3/16" = 1'–0"

NOTE:

FINAL ROADWAY CROSS SECTION MAY DIFFER FROM THE SECTION SHOWN ABOVE BASED ON FINAL DETERMINATION OF VEHICULAR AND BIKE LANE WIDTHS REQUIRED.

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NEW CONCRETE ARCHES
ALTERNATIVE 2

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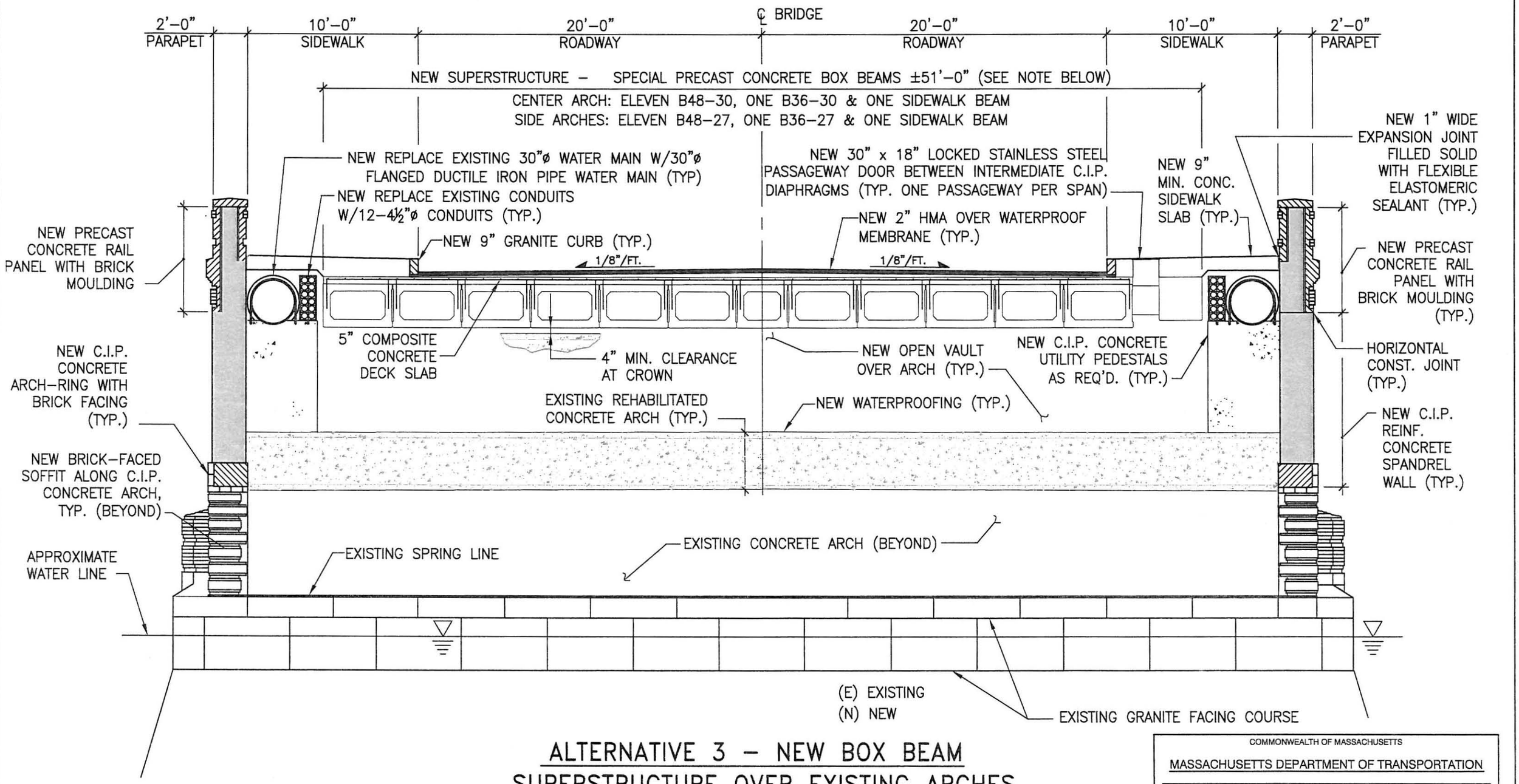

ALTERNATIVE 3 – NEW BOX BEAM SUPERSTRUCTURE OVER EXISTING ARCHES

3/16" = 1'–0"

NOTE:

FINAL ROADWAY CROSS SECTION MAY DIFFER FROM THE SECTION SHOWN ABOVE BASED ON FINAL DETERMINATION OF VEHICULAR AND BIKE LANE WIDTHS REQUIRED.

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NEW BOX BEAM SUPERSTRUCTURE
ALTERNATIVE 3

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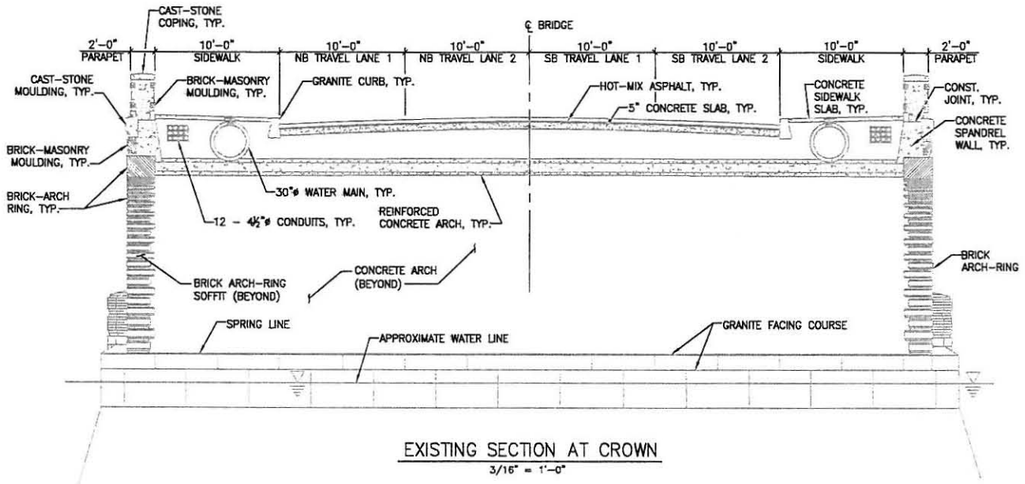
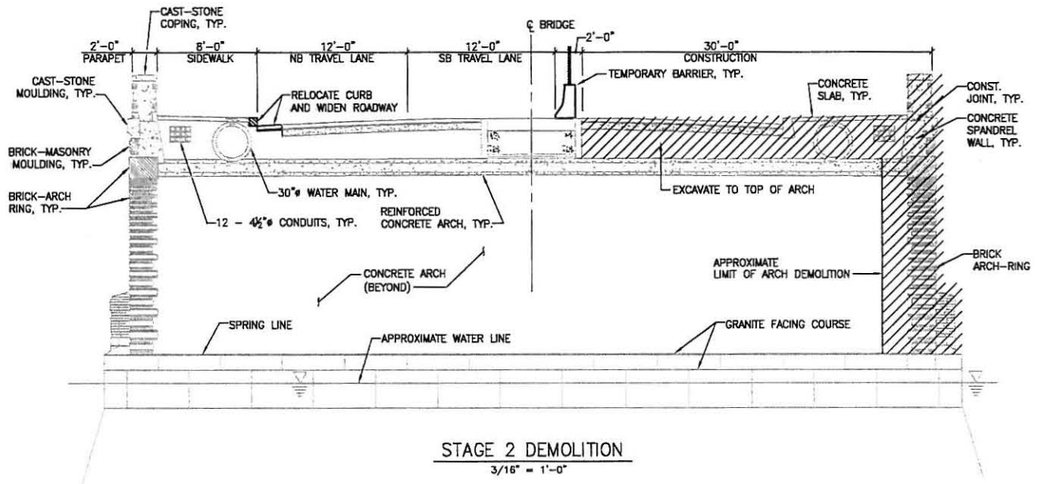


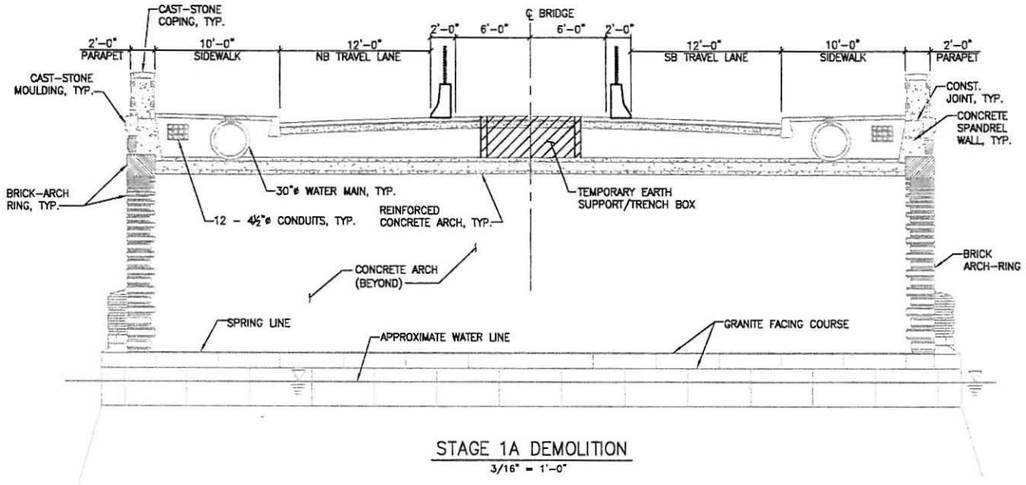
EXISTING SECTION AT CROWN

3/16" = 1'-0"



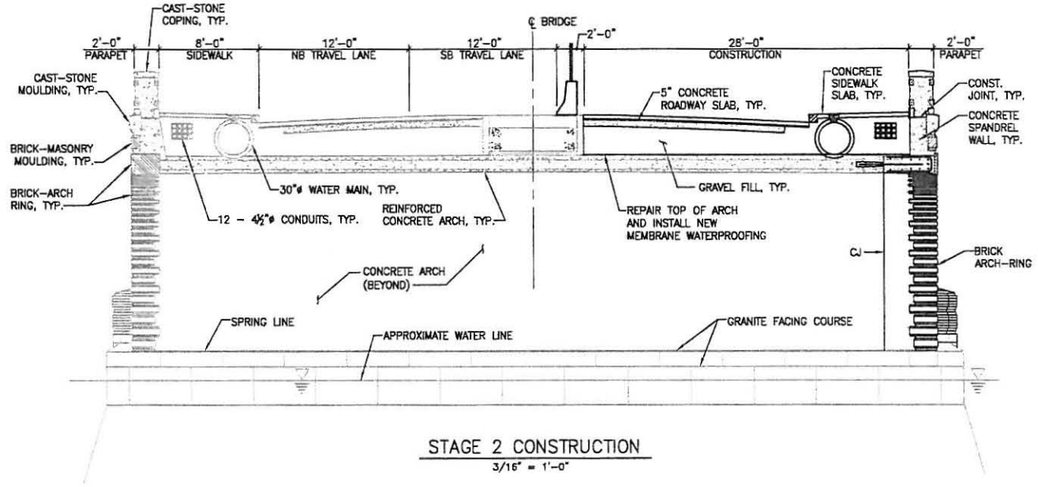
STAGE 2 DEMOLITION

3/16" = 1'-0"



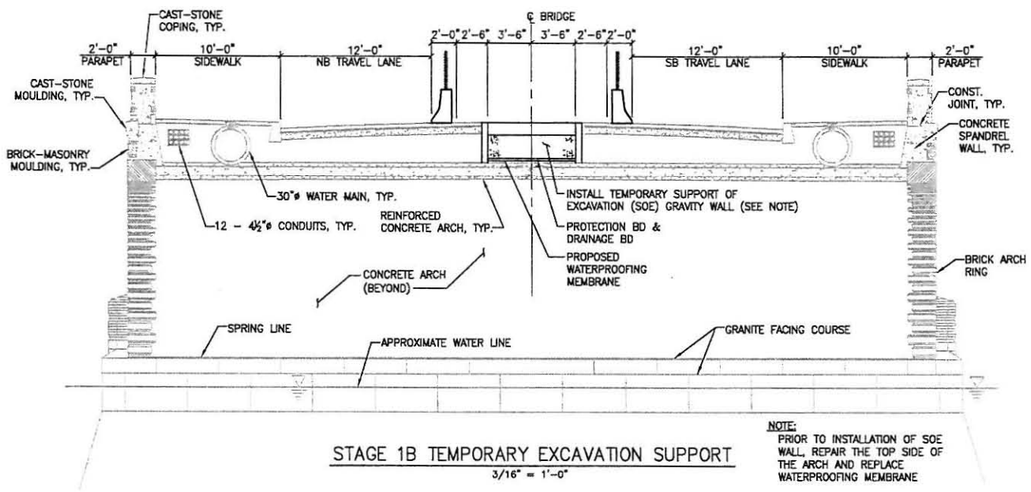
STAGE 1A DEMOLITION

3/16" = 1'-0"



STAGE 2 CONSTRUCTION

3/16" = 1'-0"



STAGE 1B TEMPORARY EXCAVATION SUPPORT

3/16" = 1'-0"

NOTE:
PRIOR TO INSTALLATION OF SOE WALL, REPAIR THE TOP SIDE OF THE ARCH AND REPLACE WATERPROOFING MEMBRANE

FILENAME: R:\V0-061 LARZ ANDERSON\03 CADD\05-24-10_REVISED_STAGING\REVISED_STAGING.DWG - May 24, 2010 - 4:12pm

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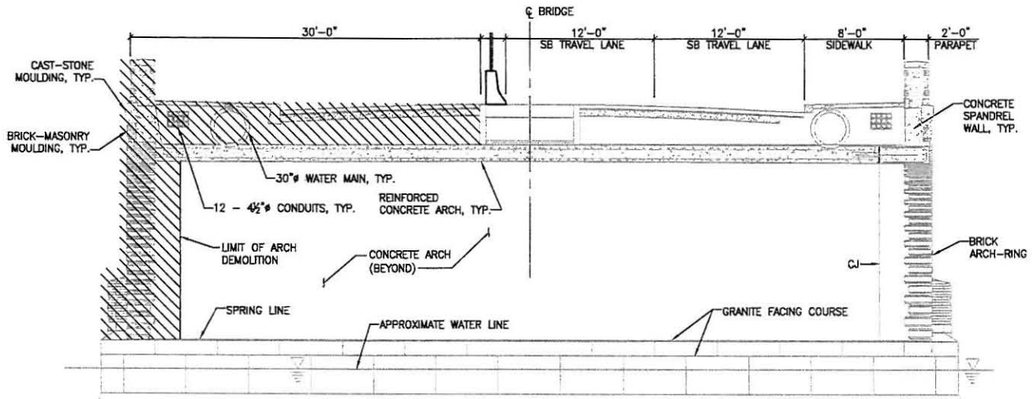
ANDERSON MEMORIAL BRIDGE
BOSTON

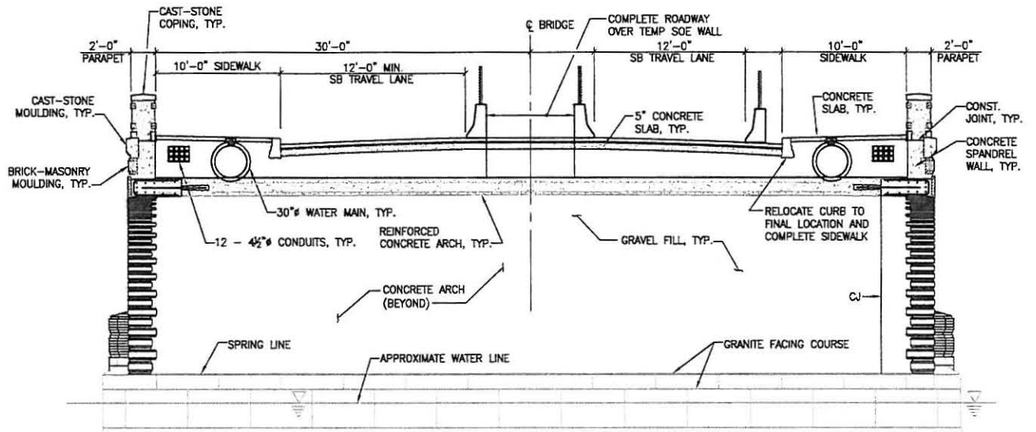
STAGE CONSTRUCTION - PART 1

DESIGNED:	CONTRACT NO.			FIG. NO.
CHECKED:				11
DRAWN:	REF.	CONT.	SCALE: AS NOTED	
CHECKED:	ACC.		DATE: 05/10	

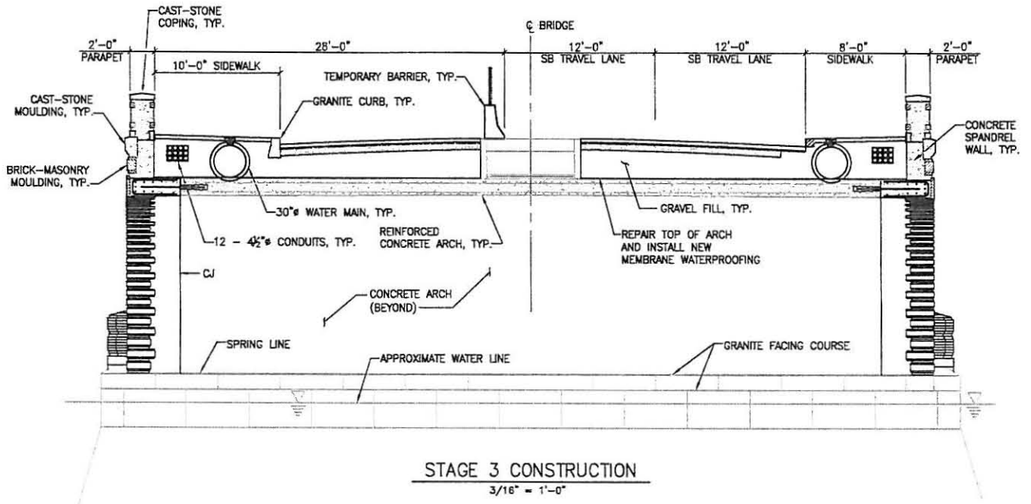
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803



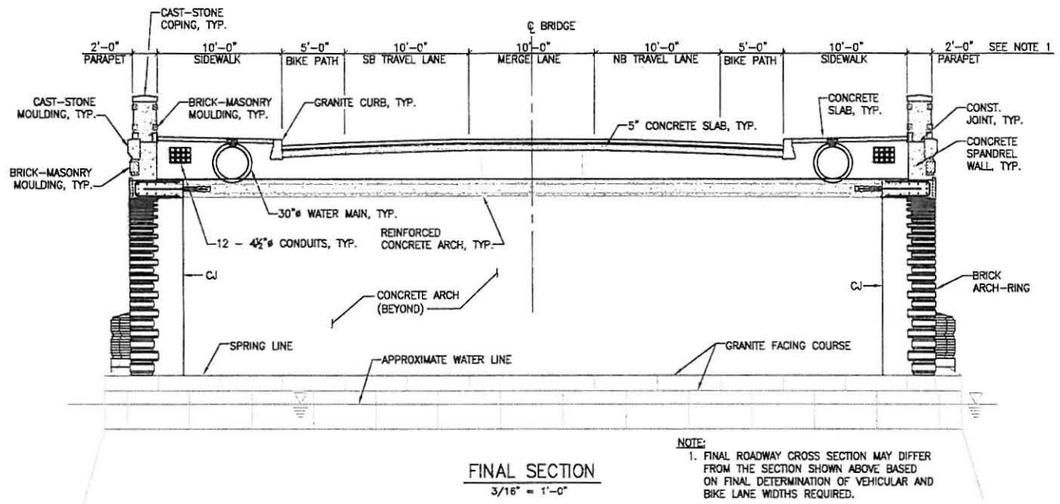
STAGE 3 DEMOLITION
3/16" = 1'-0"



STAGE 3 FINAL ROADWAY CONSTRUCTION
3/16" = 1'-0"



STAGE 3 CONSTRUCTION
3/16" = 1'-0"



FINAL SECTION
3/16" = 1'-0"

NOTE:
1. FINAL ROADWAY CROSS SECTION MAY DIFFER FROM THE SECTION SHOWN ABOVE BASED ON FINAL DETERMINATION OF VEHICULAR AND BIKE LANE WIDTHS REQUIRED.

COMMONWEALTH OF MASSACHUSETTS

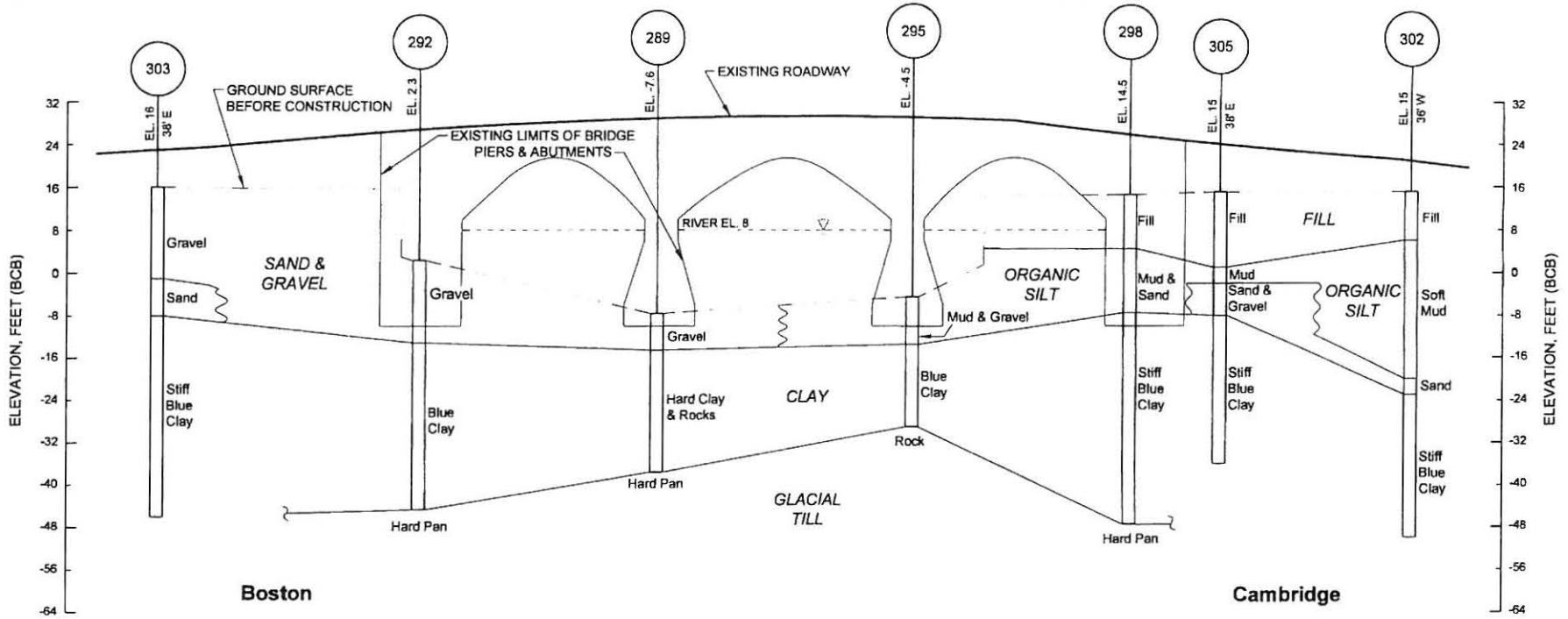
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

ANDERSON MEMORIAL BRIDGE
BOSTON

STAGE CONSTRUCTION - PART 2

DESIGNED:	CONTRACT NO.		FIG. NO.
CHECKED:			12
DRAWN:	REF.	CONT.	SCALE: AS NOTED
CHECKED:	ACC.		DATE: 05/10

FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803



LEGEND

B504 — BORING NUMBER

EL. 14.5 55' E — ELEVATION OF GROUND SURFACE AND OFFSET OF BORING FROM CENTERLINE OF BRIDGE

EXISTING GROUND SURFACE

CLAY — STRATUM NAME

STRATUM BOUNDARY

Stiff Blue Clay — DESCRIPTION FROM BORING

HORIZONTAL SCALE, FEET
0 50 100
0 20 40
VERTICAL SCALE, FEET
NOTE: 2.5x VERTICAL EXAGGERATION

NOTES

1. BORING LOCATIONS AND LOGS ARE SHOWN IN APPENDIX A.
2. THE BOUNDARIES BETWEEN SOIL STRATA MAY BE TRANSITIONAL. THE STRATA BOUNDARIES BETWEEN BORINGS MAY VARY SIGNIFICANTLY FROM THE INTERPOLATIONS SHOWN.
3. EL. 0.0 BOSTON CITY BASE = EL. -5.65 NGVD.
4. PROFILE ALONG CENTERLINE OF BRIDGE LOOKING WEST.

Rehabilitation of the Larz Anderson Bridge Boston and Cambridge, Massachusetts	GEI Consultants	SUBSURFACE PROFILE
Fay, Spofford, & Thorndike Burlington, Massachusetts	Project 09257-0	May 2010 Fig. 2

M:\DRAFTING\2009\09257 Anderson Bridge\092570-02

FIGURE 13 – SUBSURFACE PROFILE

ATTACHMENT 6

Bike and Pedestrian Underpass Feasibility Study
And Correspondence

Rehabilitation of the Anderson Memorial Bridge
Bridge No. B-16-011=C-01-007
North Harvard Street over Charles River
Boston - Cambridge
MassDOT Project No. 605517

Bike and Pedestrian Underpass Feasibility Study

Prepared for:

Massachusetts Department of Transportation (MassDOT)
Highway Division
Ten Park Plaza
Boston, MA 02116

Prepared by:

Fay, Spofford & Thorndike
5 Burlington Woods
Burlington, MA 01803

Revised January 25, 2011

1.0 INTRODUCTION

1.1 General

The Anderson Memorial Bridge Rehabilitation Project is part of the Commonwealth's Accelerated Bridge Program. The Massachusetts Department of Transportation Highway Division (MassDOT) has hired the consulting firm of Fay, Spofford & Thorndike (FST) to study the feasibility of constructing a pedestrian/bicycle underpass through the existing bridge approach walls and a boardwalk pedestrian/bicycle underpass of the outer bridge arches.

1.2 Scope of the Study

The scope of the Underpass Feasibility Study is to assess the following:

1. The feasibility of constructing pedestrian/bicycle underpasses through the Anderson Memorial Bridge approach walls and outer tunnels.
2. Determine the impact that the addition of underpasses will have on the proposed project schedule.
3. Develop an estimated cost to construct the pedestrian/bicycle underpasses.
4. Determine whether or not the proposed Anderson Memorial Bridge Rehabilitation Project (if constructed without underpasses) precludes the ability to build underpasses in the future.

The proposed scope for the Rehabilitation of the Anderson Memorial Bridge was used as a baseline for assessing cost and schedule impacts associated with construction of the underpasses. The currently proposed rehabilitation scope for the structurally deficient Anderson Memorial Bridge includes the following major items:

- Retain and rehabilitate the existing concrete arches;
- Excavate to expose the top side of the arches, repair the concrete and replace the waterproofing;
- Complete replacement of the existing parapets, spandrel walls and brick arch rings along the fascias of the arches and;
- Complete replacement of the approach walls at both approaches and the northwest stairway.

1.3 Existing Bridge Description

The Anderson Memorial Bridge is a three-span concrete arch that carries

North Harvard Street over the Charles River in Boston and Cambridge. The bridge measures 232 feet between abutments and has an overall length of 410 feet, inclusive of the retained fill approaches. The arches are supported by abutments and piers that are comprised of massive concrete footings founded on tightly spaced timber piles. The approach walls are unreinforced concrete gravity walls that are founded on timber piles on the Cambridge side and spread footings on the Boston side.

This historic bridge was built in 1915 and is an integral component of the Charles River Basin Historic District (Historic District), which is listed on the State and National Registers of Historic Places.

2.0 Feasibility Assessment

2.1 Alternatives

The following are the key factors that were considered in assessing the feasibility, cost and schedule impacts associated with the addition of underpasses to the Anderson Memorial Bridge rehabilitation project.

- Structural Impact on the Bridge
- Civil Alignment and Profile of the Underpasses
- Right-of-Way
- Utility Impacts
- Environmental Permitting
- Effects on Cultural Resources

Several underpass/boardwalk concepts were developed. The conceptual underpass/pathway designs include a minimum vertical clearance of 8 feet and a clear width of 16 feet, in accordance with the AASHTO requirements and MassDOT guidelines. The profiles and grades along the path were set based on a maximum 5% nominal grade, in accordance with the requirements of the Americans with Disabilities Act (ADA) and the Massachusetts Architectural Access Board (MAAB). The nominal grade of 5% can be refined to 4.5% during design as recommended by MassDOT to allow for construction tolerances.

The alignments were developed to tie the underpasses back into to the Charles River Reservation trail system and the existing sidewalks on Soldiers Field Road and Memorial Drive.

The following is a description of the underpass/boardwalk concepts that were evaluated.

Alternative 1A

Underpass on Cambridge Approach with Relocated Water Mains
This alternative would include a concrete underpass through the Cambridge approach walls (see Figures 1, 2, 11 and 12). The underpass would be located a minimum of 10 feet behind the back face of the existing bridge abutment to facilitate rerouting of two existing 36" water mains on the bridge. This alternative also would require the reconfiguration or elimination of the existing stairway located at the northwest approach wall which would have an adverse effect on the historical integrity of the bridge and Historic District.

By rerouting the water mains, the profile of the underpass could be raised such that the top of the floor slab would be maintained approximately 2.6 feet above the normal water level of the Charles River, observed at elevation 1.3 feet (NAVD88). However, the profile would require construction of wingwalls and retaining walls outside the limits of the bridge and near the Weld Boathouse, which would have an adverse effect on the Historic District.

Alternative 1B

Underpass on Cambridge Approach Located Below Water Mains
This alternative would include a concrete underpass through the Cambridge approach walls (see Figures 3, 4, 13 and 14). The underpass would be located an estimated 4 feet behind the back face of the existing bridge abutment and would be located beneath the two existing water mains. This alternative would also impact the stairway located at the northwest approach, which would have an adverse effect on the historical integrity of the bridge and Historic District.

By lowering the profile of the underpass such that the existing water mains could be maintained, the underpass and pathways would be approximately 2.4 feet below the normal water level of the Charles River. In addition, the lower profile would require construction of wingwalls and retaining walls outside the limits of the bridge and near the Weld Boathouse, which would have an adverse effect on the Historic District.

Alternative 2

Boardwalk Under the Exterior Arch (Cambridge)
In lieu of providing a concrete underpass through the approach walls, we investigated using a boardwalk (see Figures 5 and 15) similar to what was done at the Boston University Bridge. This alternative would include a timber boardwalk structure that extends out into the Charles River and beneath the exterior arch. The boardwalk would include a walkway clear width of 12 feet, and

42-inch high railings. The profile would be set based on maintaining an 8-foot minimum vertical clearance to the underside of the arch.

The vertical clearance requirement, coupled with the low profile of the arches would result in the boardwalk being located approximately 15 feet from the face of the abutment. This would reduce the clear channel opening at the exterior span from 65'-4" to approximately 37'. This would have a negative impact on the hydraulic opening, boat navigation, and rowing usage at the side channels of the bridge and would most likely have an adverse effect on the integrity of the Historic District.

Alternative 3A

Underpass on Boston Approach with Relocated Water Mains
This alternative would include a concrete underpass through the Boston approach walls (see Figures 6, 7 and 16). The underpass would be located a minimum of 10 feet behind the back face of the existing bridge abutment to facilitate the rerouting of the two existing water mains (36" with concrete encasement).

By rerouting the water mains, the profile of the underpass could be raised such that underpass/pathway could be maintained approximately 3.2 feet above the normal water level for the Charles River. However, the profile would require construction of wingwalls and retaining walls outside the limits of the bridge, which would have an adverse effect on the historic integrity of the bridge and the Historic District.

Alternative 3B

Underpass on Boston Approach Located Below Water Mains
This alternative includes a concrete underpass through the Boston approach walls (see Figures 8, 9 and 17). The underpass would be located an estimated 4 feet behind the back face of the existing abutment and beneath the two existing water mains.

By lowering the profile of the underpass such that the existing water mains could be maintained, the underpass and pathways would be approximately 1.0 foot below the normal water level for the Charles River. This would require construction of wingwalls and retaining walls outside the limits of the bridge, which would have an adverse effect on the historic integrity of the bridge and the Historic District.

Alternative 4

Boardwalk Under the Exterior Arch (Boston)
Similar to Alternative 2 (Boardwalk on the Cambridge side), we developed an alternative for a timber boardwalk on the Boston approach (see Figure 10 and 15). The geometrics would be the same on both exterior arches and both boardwalks would need to be located 15 feet off the face of the abutment. Similarly, the resultant clear channel opening at the exterior span would be reduced from 65'-4" to approximately 37'. This would have a negative impact on the hydraulic opening, boat navigation, and rowing usage at the side channels of the bridge. Furthermore, this alternative will require construction of retaining walls outside the limits of the bridge, which would most likely have an adverse effect on the integrity of the Historic District.

The impact on the boating community would be magnified if a boardwalks were installed under both exterior arches. Following the December 2009 informational meeting for the project, the rowing community highlighted the importance of maintaining water clearance at all three barrels at the Anderson Memorial Bridge as well as their safety concerns related to boating activity in and around the bridge. It is highly likely that pursuit of the boardwalk alternatives would face significant opposition from the boating community.

2.2 Structural Impacts on the Existing Bridge

The Anderson Memorial Bridge is a 3-span reinforced concrete arch structure with a clear span at spring line of 65'-4" at the end spans, and 75'-6" at the center span. The abutments at the end span of the arches are comprised of concrete and rubble-concrete construction.

The following structural types have been considered for the various underpass alternatives:

Underpass Tunnel Structure
Alternatives (1A, 1B, 3A, and 3B) call for a concrete box tunnel that can be either precast or cast-in-place (see Figures 11-14, and 16-17). Construction of the tunnel would have a structural impact on the existing structure, and would impact the project's design and construction schedules, in terms of structural modifications to the bridge approach walls and design and implementation of stage construction.

Boardwalk Structure
Alternatives 2 and 4 (see Figure 15), call for a treated timber boardwalk under the exterior arches. The boardwalk would be supported on mini-piles due to

constrained headroom, and would be structurally independent from the existing bridge. The boardwalk alternative would impact the bridge design and construction schedules in terms of navigation traffic management to keep two channels open at all times during construction, in coordination with the repair of the underside of the concrete arches.

Southeast Wingwall – Boston Approach

Southwest Wingwall – Boston Approach

Northwest Wingwall – Cambridge Approach

Northeast Wingwall – Cambridge Approach

Elevation View of the Approach Walls

Arch and Abutment Impacts

Preliminary analysis indicates that the existing timber piles that support the bridge abutments do not have sufficient capacity to resist the thrust on the arches without the benefit of the passive soil behind the abutment. Therefore, a bracing support system would be needed to excavate and install the underpass tunnel behind the abutments without a structural adverse impact to the bridge. We would recommend that the abutments be monitored during construction. The reason for concern stems from the fact that the abutments have benefitted from passive and at-rest soil pressure against the abutments for almost 100-years and this secondary lateral support system may be sharing the lateral load with the timber piles. Removal of the soil could result in a load transfer back to the pile

group and lead to some longitudinal movements, which could potentially lead to cracking within the arch. This could be mitigated via strutting across the excavation and including excavation/staging sequence restrictions in the construction contract.

The additional bracing, monitoring and excavation/sequencing controls would have cost and schedule impacts to the project.

Approach Wall Impacts
The existing approach walls are deteriorated to the point that they need to be completely replaced. The new walls could be designed to include the underpass tunnel and there would be cost and schedule impacts.

2.3 Civil Alignment and Profile of the Underpasses

The alignments and profiles for each alternative have been provided herein (see Figures 1 thru 10). The alignments were developed to suit existing conditions and constraints, such as the rerouting of the pipelines. The profiles were also developed to avoid adverse impacts where possible, provide minimum cover over the tunnel and to avoid having low points within the underpass tunnels.

2.4 Right-of-Way

All properties that would be impacted by the proposed underpasses along both sides of the Charles River are owned and managed by the Massachusetts Department of Conservation and Recreation (DCR). This includes the land where the Weld Boathouse is located, which is under a lease agreement with the Commonwealth of Massachusetts.

2.5 Utility Impacts

There are a number of utilities that run along the Anderson Memorial Bridge that would need to be relocated or temporarily supported to facilitate construction of the underpasses. The impacted existing utilities include:

MWRA Water Mains
There are two water mains on the bridge, each is a 30” line under the east and west sidewalks. The two lines run over the top of the arches and reconnect into a single 48” line approximately 50 to 60 feet behind the back face of both abutments. The water mains are owned by the Massachusetts Water Resources Authority (MWRA) and are an integral part of the Spot Pond West pipeline (identified as Section 10). The Spot Pond West pipeline is one of two pipelines that convey water supply from south to north as part of the MWRA’s Low Service distribution system. The pipelines are comprised of cast iron pipe on the bridge

that transitions to concrete encased pipe within the approaches. Although these pipelines are critical elements within the MWRA's water distribution system, we feel after discussions with MWRA that they could be temporarily taken out of service and locally reconfigured if necessary to support the bridge rehabilitation and/or the underpass construction.

Conduits

There are two concrete encased duct banks on the bridge: a telephone duct bank under the west sidewalk and an MBTA electric duct bank under the east sidewalk. These duct banks could be reconfigured, if necessary to accommodate an underpass.

Miscellaneous Utilities

There are electrical conduits that feed the street lighting, and surface mounted 1 inch steel conduits on the fascia for the navigational lights. These utilities in the area of the bridge approach walls could be supported in place or relocated to accommodate the underpass construction.

Major Utility Impact and Mitigation

The most critical utility with respect to the construction of the underpasses are the MWRA water mains. We currently anticipate in the bridge rehabilitation project (without underpasses), that these lines would be replaced and that isolation valves would be installed at each approach.

However, the existing pipeline alignments and profiles at the approaches pose a significant hurdle to the construction of the pedestrian underpasses. There are two options with respect to mitigating the impact of the water mains: 1- reroute the pipelines (Alternatives 1A and 2A) or 2- constructing the underpass below the water lines which places the top of the floor slab below the normal water level in the river (Alternatives 1B and 2B). Installing the underpass beneath the water lines would require positive means to control the water and could have long-term maintenance issues.

With respect to rerouting the pipelines, we assessed the following two options:

1. Reconfigure the pipelines such that the two lines are connected just behind the abutment into a new single 48-inch line that would run parallel between the underpass and the back face of the abutment and under the approach wall. This would require approximately 10 feet of clearance between the abutment and the underpass. From here, the line would run parallel to the pathway for a length sufficient to allow the pipe to run under the underpass and reconnect to the original alignment.

2. The interference could also be eliminated, if the entire waterlines running across the bridge were replaced with a new crossing under the river via directional drilling or other soft ground tunneling techniques. This assumes that a suitable site could be found, which is beyond the scope of this report. This option would be very costly, have major schedule and permitting impacts and would need to be done as a separate MWRA project. Based on these issues, we have assumed that this option is not feasible with respect to constructing the underpass at this time.

2.6 Cultural Resources

The following is a preliminary assessment of potential historic issues related to adding underpasses to the approaches of the Bridge:

Underpass Alternatives

Boston (Allston) Approach – The addition of an underpass through the Boston approach walls would have an adverse effect on the historical integrity of the Anderson Memorial Bridge. This would require an alternative analysis under the Section 106 or the Chapter 254 review process and would substantially affect the project schedule.

Cambridge Approach – The northwest approach wall on the Cambridge side has a stair structure connecting the bridge (North Harvard Street) to the park area along the Charles. The stair structure is a character-defining historic feature of the bridge and is located within the vicinity of where the underpass would need to be installed. Adding the underpass would require the elimination or major reconfiguration of the stairway, which contains significant architectural features, such as the balustrades and railing that are defining features of the bridge. Eliminating the stairway or a major reconfiguration would result in an adverse effect. Getting this reviewed and approved would have a significant impact on the project schedule.

The other issue related to the underpass on the Cambridge approach is the presence of the Weld Boathouse at the northeast corner of the bridge. Built in 1907, the boathouse is within and is a contributing component to the Charles River Basin National Register-listed Historic District. The path to connect the underpass with the existing sidewalk would require retaining walls and/or regrading of the grounds surrounding the boathouse (see photo). Even though

the actual boathouse structure would not be directly impacted, the setting of the building would be impacted.

In summary, an underpass on either side of the bridge would have an adverse effect on the bridge and the Historic District under Section 106 or Chapter 254 review. The project ultimately requires the approval of the State Historic Preservation Officer (SHPO).

Area between Weld Boathouse & Northeast approach wall

Boardwalk Alternatives (both approaches)

The addition of a boardwalk under the bridge exterior arches and the associated approaches in front of the bridge wingwalls could have an adverse effect on the Historic District. The project would need to be approved by the State Historic Preservation Officer (SHPO), which would potentially impact the project schedule.

Archaeological

Alternatives 1A and 1B (underpass on the north side of the bridge) require additional excavation where the pathways tie into the underpass. This will require additional research to determine if there is potential to impact a site of prehistoric activity on the north side of the Anderson Bridge. An inventoried archaeological site was identified within the DCR's Master Plan for the Charles River Basin.

2.7 Environmental Permitting

As a sub consultant to FST, CDW Consultants, Inc. prepared a "*Preliminary Summary Report of Anticipated Permits and Approvals"* dated November 2009. The report was prepared in collaboration with, and under the review of MassDOT Environmental Section. This report was specific to the proposed rehabilitation of the Anderson Memorial Bridge and did not include the underpass options discussed herein. The report assumed that the permanent modifications and repairs would stay within the footprint of the existing bridge and that all work would take place within the 100-foot buffer zone and require the use of barges in the Charles River. The project's 25% Design submittal included the removal of more than five public shade trees of 14 or more inches in diameter at breast height. Based on these assumptions and the 25% Design, CDW in collaboration with MassDOT Environmental Section determined that the following environmental permits would be required for the proposed bridge rehabilitation project:

- Programmatic Categorical Exclusion (CE) under the National Environmental Policy Act (NEPA) is not anticipated at this time. This will become required, along with 4(f) evaluation, should Federal funding be used in the future of the project.
- Letter of Construction issued to U.S. Coast Guard (USCG) is required to coordinate construction services. A US Coast Guard permit is required if there will be a change to the dimensions of the hydrological opening, which we do not anticipate at this time.
- A US Army Corps of Engineers permit may be required for the proposed rehabilitation project depending on the extent of work to the riprap and abutments. However, based on the 25% Design, it is anticipated that the proposed work may occur under the Maintenance Exemption of the Massachusetts Programmatic Agreement.
- Historical review and approval by the State Historic Preservation Officer (SHPO). Since Federal funding or permits (ACOE or USCG) are not anticipated, then Section 106 Historical review may not be required, in which case a Chapter 254 Historical review will occur. FST/CDW and MassDOT Cultural Resources Unit feel that an adverse effect determination may be avoided if the project is constructed as designed at 25% Design.
- The filling of Notices of Intent (NOIs) with the Boston and Cambridge Conservation Commissions in accordance with the Massachusetts Wetlands Protection Act (MGL. c. 131 s 40) and its implementing Regulations (310 CMR 10.00) will be required.
- Environmental Notification Form (ENF) under the Massachusetts Environmental Policy Act (MEPA) Regulations (301 CMR 11.00). An ENF filing is required due to the removal of public shade trees (more than 5 with diameters of 14 inches and more).

The following is a summary by FST in collaboration with CDW and MassDOT on the ***additional*** environmental clearances that may be required if the project scope was expanded to include a bicycle and pedestrian underpass tunnel or boardwalk structure.

Tunnel Alternatives

The proposed tunnel alternatives (Alternatives 1A, 1B, 3A and 3B) call for construction within the 100-foot buffer zone to Bank, 25-foot Riverfront Area, and Bordering Land Subject to Flooding BLSF, known as the 100-year floodplain) associated with the Charles River.

MA DEP Chapter 91 License

The Anderson Memorial Bridge is a licensed structure under the MA Department of Environmental Protection (DEP) Chapter 91 Program. The construction of an underpass may require an amendment to the existing Chapter 91 license to authorize a structural alteration or the filing of a new Chapter 91 license if the structural alteration is deemed substantial.

Additional research will be required to determine if the proposed activities are located on filled tidelands. A pre-application consultation meeting with DEP would be recommended to discuss the proposed change in project scope.

Section 106 / Chapter 254 Historical review and approval by the State Historic Preservation Officer (SHPO).

An adverse effect determination will not be avoided with the proposed underpasses, and will require a review and approval by the State Historic Preservation Officer (SHPO).

The project will be reviewed under Chapter 254 or Section 106, depending on whether Federal permits or funding are required/utilized. While a no adverse effect determination is anticipated for the project as designed at 25%, the addition of the tunnels will trigger an adverse effect determination for the bridge or the Historic District. Coordination and additional alternatives analysis would be needed for the historical review and would cause significant schedule delays.

Boardwalk Alternatives

The proposed boardwalks - Alternatives 2 and 4 (Figures 5 and 10), call for work within Land Under Waterbodies (LUW), Bank, 100-foot buffer zone to Bank, 25-foot Riverfront Area, and Bordering Land Subject to Flooding (BLSF) (known as the 100-year floodplain) associated with the Charles River and result in permanent impacts to these resource areas. It is anticipated that boardwalk construction would take place from a barge and would be limited to the construction of the support bents and mini-pile foundations. Boardwalk construction within the Charles River would require the following additional environmental clearances:

U.S. Coast Guard (USCG) Permit

Boardwalk construction under the exterior concrete arch would reduce the existing hydraulic opening at the Anderson Memorial Bridge. Therefore, the project would require filing an application for a USCG bridge permit pursuant to Section 9 of the Rivers and Harbors Act and the General Bridges Act.

U.S. Army Corps of Engineers (ACOE) Section 10 General Permit

The boardwalk alternatives would require an ACOE Category 2 General Permit under section 10, as a boardwalk would be a structure in a navigable waterway. Geotechnical borings within the Charles River would be required for the design of the boardwalk foundations. Consequently, this would also require the preparation of Category 1 Form in accordance with the U.S. Army Corps of Engineers (ACOE) Section 10 Programmatic General Permit (PGP).

Section 106/Chapter 254 Historical review and approval by the State Historic Preservation Officer (SHPO).
Since USCG and ACOE permits would be required, then Section 106 Historical review would be required, instead of the Chapter 254 review that is anticipated for the bridge rehabilitation without underpasses/boardwalks. An adverse effect determination would not be avoided with the boardwalk alternatives, and would require a review and approval by the State Historic Preservation Officer (SHPO).

Water Dependent Chapter 91 License
The boardwalk would be located within a non-tidal, navigable waterway and would not be a previously licensed structure. Therefore, pursuant to the Massachusetts Chapter 91 Waterways Act, an application would need to be filed with MA Department of Environmental Protection (DEP) for a Water Dependent Chapter 91 License.

401 Water Quality Certification (WQC)
Boardwalk construction may also require the filing of 401 WQC applications to MA DEP in accordance with the Massachusetts Surface Water Quality Standards (314 CMR 4.00). Based on the nature of the project, it is assumed that the extent of project impacts would only require filing for minor project certifications.

Environmental Notification Form (ENF) under the Massachusetts Environmental Policy Act (MEPA)
The project would exceed an additional threshold for filling an Environmental Notification Form (ENF) in accordance with the Massachusetts Environmental Policy Act (MEPA) due to the construction of a boardwalk 2,000 or more square feet in base area in flowed tidelands or other waterways [301 CMR 11.03(3)(b)(6)].

Supplemental Notice of Intent (NOI) filing with the Boston and Cambridge Conservation Commissions
Geotechnical borings within the Charles River for the design of the boardwalk foundations, would require a supplemental Notice of Intent (NOI) filing with the Boston and Cambridge Conservation Commissions in accordance with the Massachusetts Wetlands Protection Act (MGL. c. 131 s 40) and its implementing Regulations (310 CMR 10.00).

2.8 Public Safety and Increased Security Patrols

Both, the underpass tunnel and boardwalk alternatives raise crime and safety concerns to the public. Despite providing good lighting, the tunnel and/or boardwalk may present a somewhat long and dark location for crime potential. This highlights the need for added police/security patrols and/or surveillance of the access and paths by the responsible agency or city.

2.9 Improvements to Existing At-Grade Crossings

The proposed rehabilitation of the Anderson Memorial Bridge will include pedestrian improvements at the signalized roadway crossings of JFK Street in Cambridge and North Harvard Street in Boston. Improvements will consist of new ADA compliant cement concrete wheelchair ramps with detectable warning panels, new painted crosswalks, and necessary modifications to the existing signal equipment consistent with current accessibility requirements for pedestrian crossings. These improvements have been presented at public meetings, allow the project to approximate completion with the current schedule and estimate, and most significantly offer a context-sensitive option that avoids an adverse effect to the historical integrity of the bridge and Historic District.

3.0 Schedule Impacts

3.1 Design and Permitting Impacts

<u>Underpass Tunnel Alternatives (Cambridge/Boston)</u>
The design schedule, including the permitting process, would be impacted if the underpasses are added to the rehabilitation project. In addition, including the underpass tunnels as part of the rehabilitation would add considerable schedule risk to the project due to the unknowns associated with the historic review/approval process and the potential for legal challenges. Another risk factor would be the need to coordinate, design and gain approval for the rerouting of the MWRA's water mains.

<u>Boardwalk Alternatives (Cambridge/Boston)</u>
The boardwalk alternatives would have considerable permitting challenges that would result in significant schedule impacts. They would require USCG and ACOE permitting, as the boardwalk would be a structure in a navigable waterway, would change the hydraulic opening, and restrict the channel navigation by boaters and use by rowers.

Since the boardwalk construction can be made independent of the bridge, these alternatives could be implemented as a separate contract.

The Boston and Cambridge Boardwalk alternatives would have similar conditions and design and permitting parameters. Anticipated delays associated with permitting, historic reviews, and coordination with the boating and rowing community would be significant.

3.2 Construction Impacts

The estimated construction duration for the Rehabilitation of the Anderson Memorial Bridge, without underpasses is 30 months.

Although some of the underpass work could be done concurrently with the baseline construction tasks, we estimate that the underpasses (tunnel options) would add 6 months to the construction schedule. The major factors would include the following:

- Rerouting of the water mains.
- Excavation, bracing, monitoring and installation of the underpass tunnels.
- Pile driving would be required for the underpass tunnel on the Cambridge approach.
- Path construction (the path footprint would likely be used to stage the approach wall reconstruction so it cannot be done concurrently).

Although the boardwalk construction is not dependent of the Anderson Bridge rehabilitation work, it would require coordination with the project. We estimate that the underpasses (tunnel options) would also add 6 months to the construction schedule. The major factors would include the following:

- Navigation traffic management to keep two channels open at all times during construction, in coordination with the repair of the underside of the concrete arches.
- Mini-Pile and Pile bent construction, in addition to the construction of the boardwalk superstructure.
- Path construction (the path footprint would likely be used to stage the approach wall reconstruction so it could not be done concurrently).

4.0 Summary of Findings

4.1 Feasibility

In summary, the underpass tunnels or the boardwalks are structurally feasible, but have adverse impacts to the character defining features of the bridge and the surrounding area, with associated risks to the project schedule.

Alternatives 1A for the Cambridge approach and Alternative 3A for the Boston approach require the relocation of the water mains, to keep the underpass' profile above the normal water level of the Charles River. In addition Alternative 1A impacts the northwest stairs at the Cambridge approach, which would significantly alter the bridge's overall appearance. These alternatives would face a lengthy and uncertain permitting process.

Providing underpasses that are below the normal water level in the river (Alternatives 1B and 3B) would create long-term maintenance problems and would significantly alter the overall appearance of the approaches, where the approach walls would be partially blocked by retaining walls, boat sections and railings. These alternatives would also face a lengthy and uncertain permitting process.

The timber boardwalk under the exterior arches (Alternatives 2 and 4) would change the hydraulic opening, and significantly reduce the navigable channel width which would restrict boat navigation and channel use by the rowing community. Boardwalks would face a lengthy and uncertain permitting process and significant opposition from the boating and rowing community.

4.2 Impact to the project schedule

The design schedule, including the permitting process would be impacted if the underpasses are added to the rehabilitation project.

4.3 Estimated Project Cost Increases

A summary of the estimated construction and maintenance costs for each alternative is presented below. The permitting and engineering and administration costs are not included.

The maintenance costs are estimated based on current 2010 values. They include snow removal, lighting, landscaping, drainage, sweeping and cleaning, and miscellaneous items such as periodic inspections and repairs. In addition, the maintenance cost for the tunnel alternatives includes the maintenance of a sump and pumping system.

The maintenance costs do not include the cost of security patrolling and surveillance. The estimated design schedule impact in the table below does not account for permitting which would be significantly longer than the design time.

Alternative		Estimated Project Cost Increase to Add Underpasses	Estimated Annual Maintenance Costs (2010)
Alternative 1A	Underpass with Relocated Water Mains - Cambridge	$2,400,000	$24,000
Alternative 1B	Underpass Located Below Water Mains - Cambridge	$2,335,000	$26,000
Alternative 2	Boardwalk Under Exterior Arch – Cambridge	$1,170,000	$25,000
Alternative 3A	Underpass with Relocated Water Mains - Boston	$2,850,000	$24,000
Alternative 3B	Underpass Located Below Water Mains - Boston	$2,945,000	$26,000
Alternative 4	Boardwalk Under Exterior Arch – Boston	$1,760,000	$25,000

4.4 Not to Preclude Option

It has been suggested at public meetings that if MassDOT does not install the underpasses as part of the bridge rehabilitation project they should consider pursuing a design that facilitates the construction of tunnel underpasses in the future. Structural modifications that could be made to the bridge approach walls based on the assumption that underpasses would be constructed in the future include, but are not limited to the following:

- Designing the pile arrangement for the approach walls to account for a future tunnel/opening.
- Providing supplemental reinforcing in the wall to suit a future opening.
- Dedicate an area below the wall for rerouting the waterline without impacting the wall.

If these options are pursed, the bridge rehabilitation project would still be subject to potential schedule delays associated with underpass permitting and historical review processes.

APPENDIX A

Fundamentals of Rowing the Charles

The Fundamentals of Rowing on the Charles

1. 12 boathouses
2. 900 shells total
3. 500 shells with coxswains (i.e., someone is looking forward)
4. 400 shells without coxswains (i.e. no one is looking forward)
5. 2,000 – 2,500 people rowing on the river over the course of a sunny day in the spring, summer and fall
6. The Charles River at Anderson Bridge is equivalent to the interchange of the Mass Pike and 128 at 8:00 am
7. There are multiple collision; many have been hurt
8. Collisions with the work barge have been many over the last year
9. Attention to safety for the rowing public has been variable

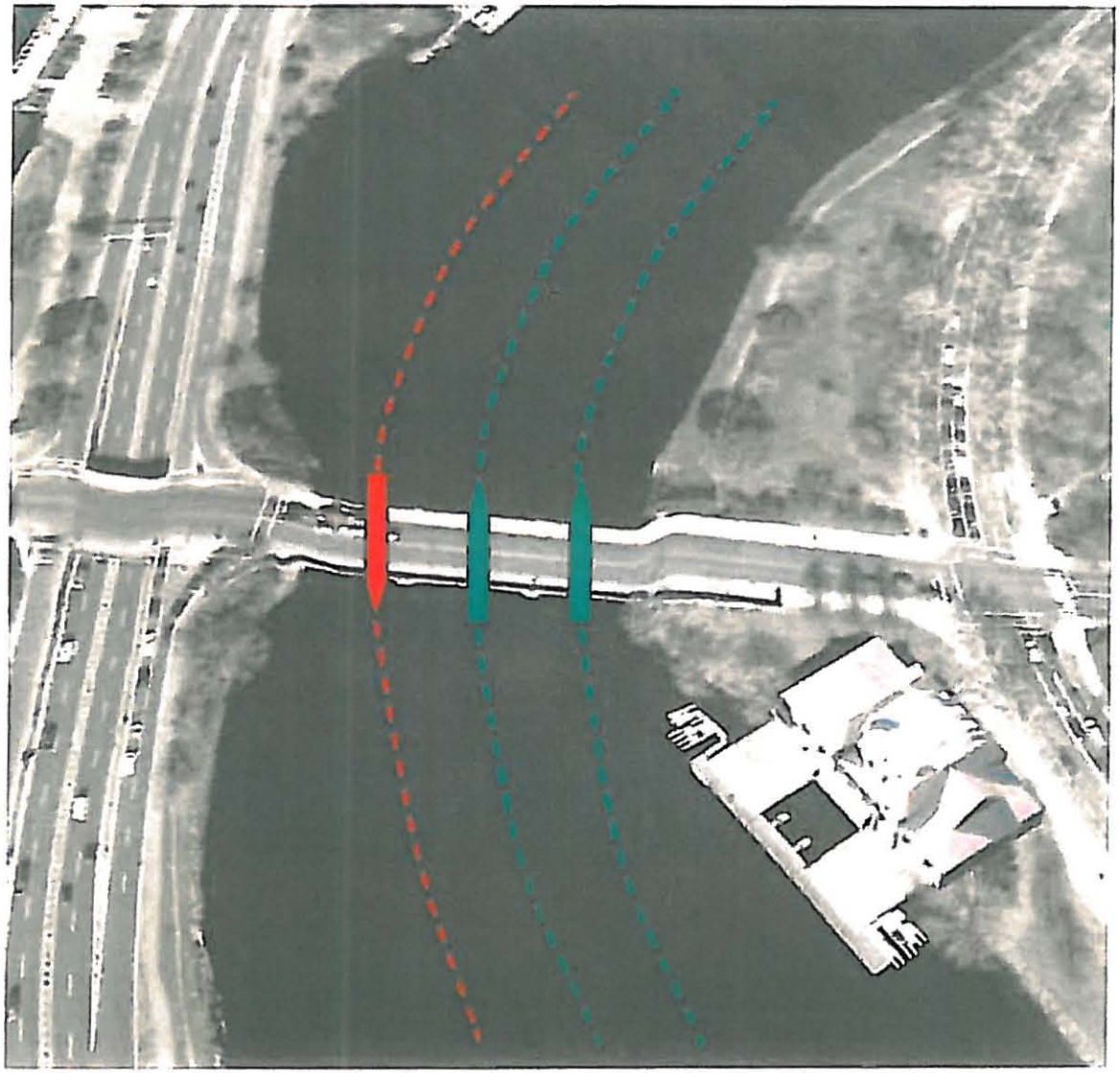
The dangers to the rowing public of work on the Anderson Bridge must be recognized and managed diligently by the work crews and the relevant authorities.

The solutions are simple and easy to implement.

Rowing Traffic Patterns through Anderson Bridge

- Upstream traffic uses the Cambridge and center arches
- Downstream traffic uses the Boston arch
- Overtaking boats have right of way

Upstream towards Watertown

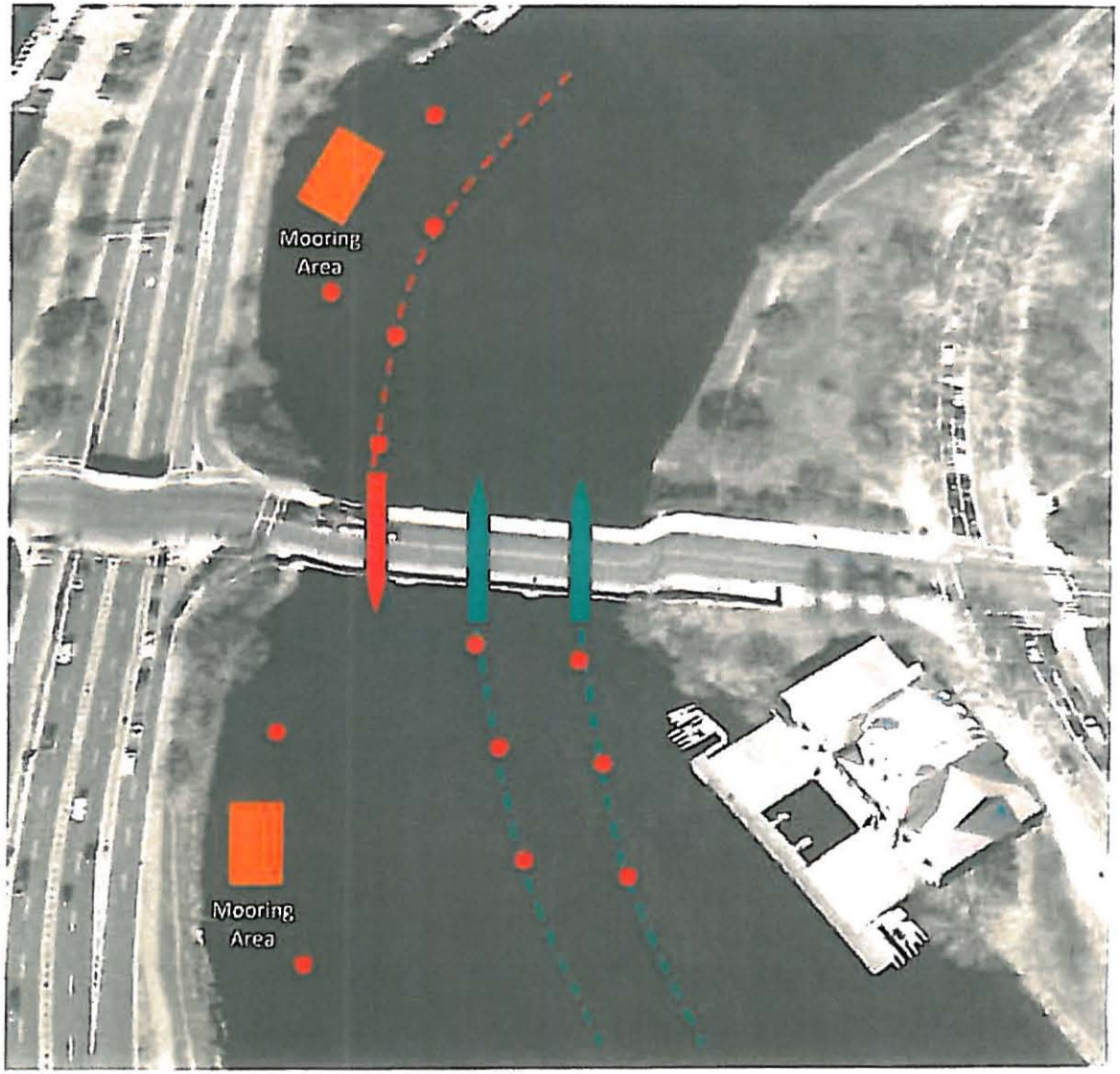


Downstream towards Boston

Proposed Safety Rules while Repairing the Anderson Bridge

- Whenever a barge obstructs an arch or any work is likely to create danger in passing through an arch, place three warning buoys 25, 50 and 75 yards downstream of the center and Cambridge arches or 25, 50 and 75 yards upstream of the Boston arch.
- When the obstruction is removed or the work no longer creates any danger, remove the buoys.
- When a barge is not in use, moor it where it doesn't obstruct rowing traffic and place a buoy 25 yards up and downstream of it.

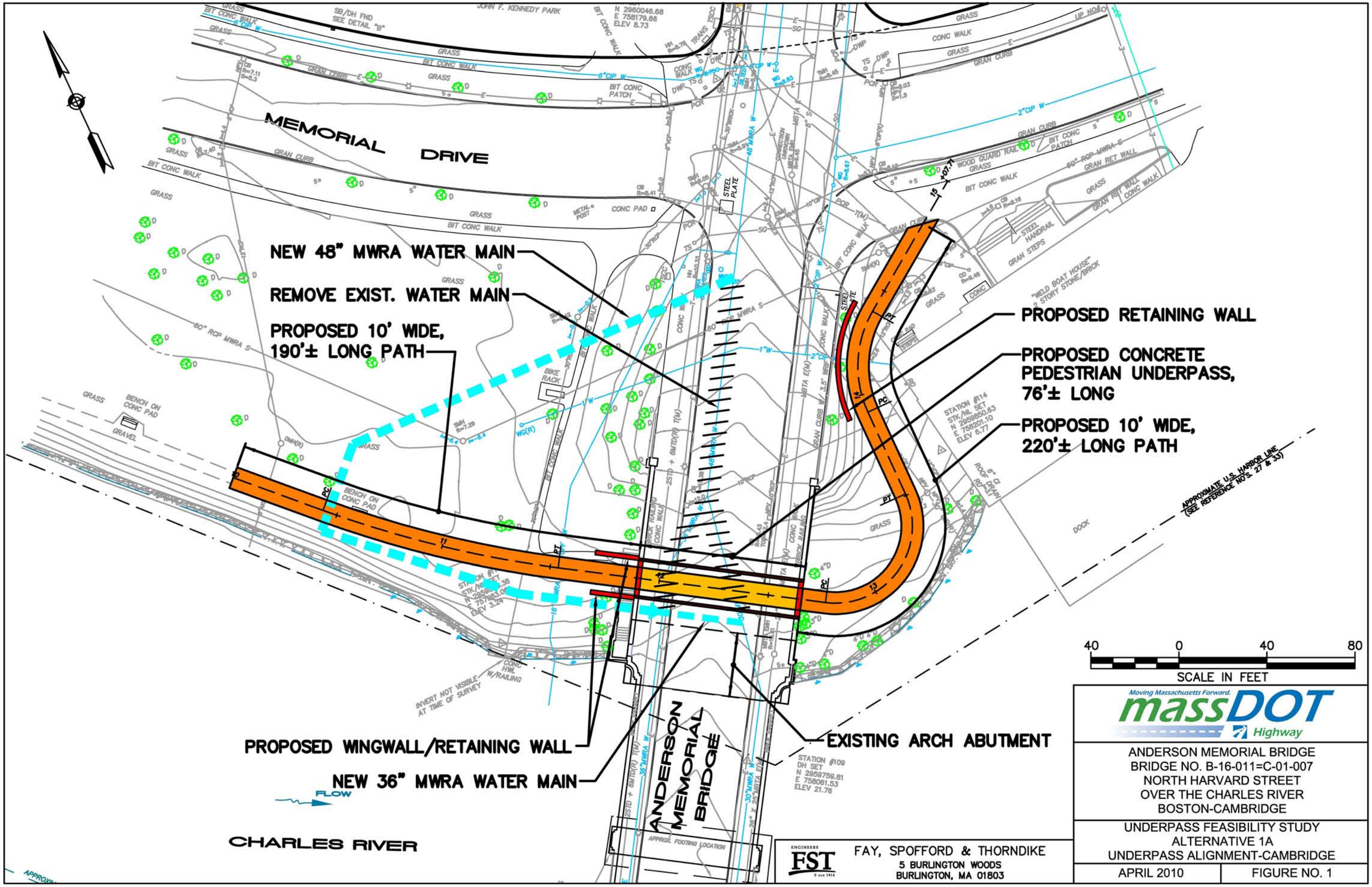
Upstream towards Watertown



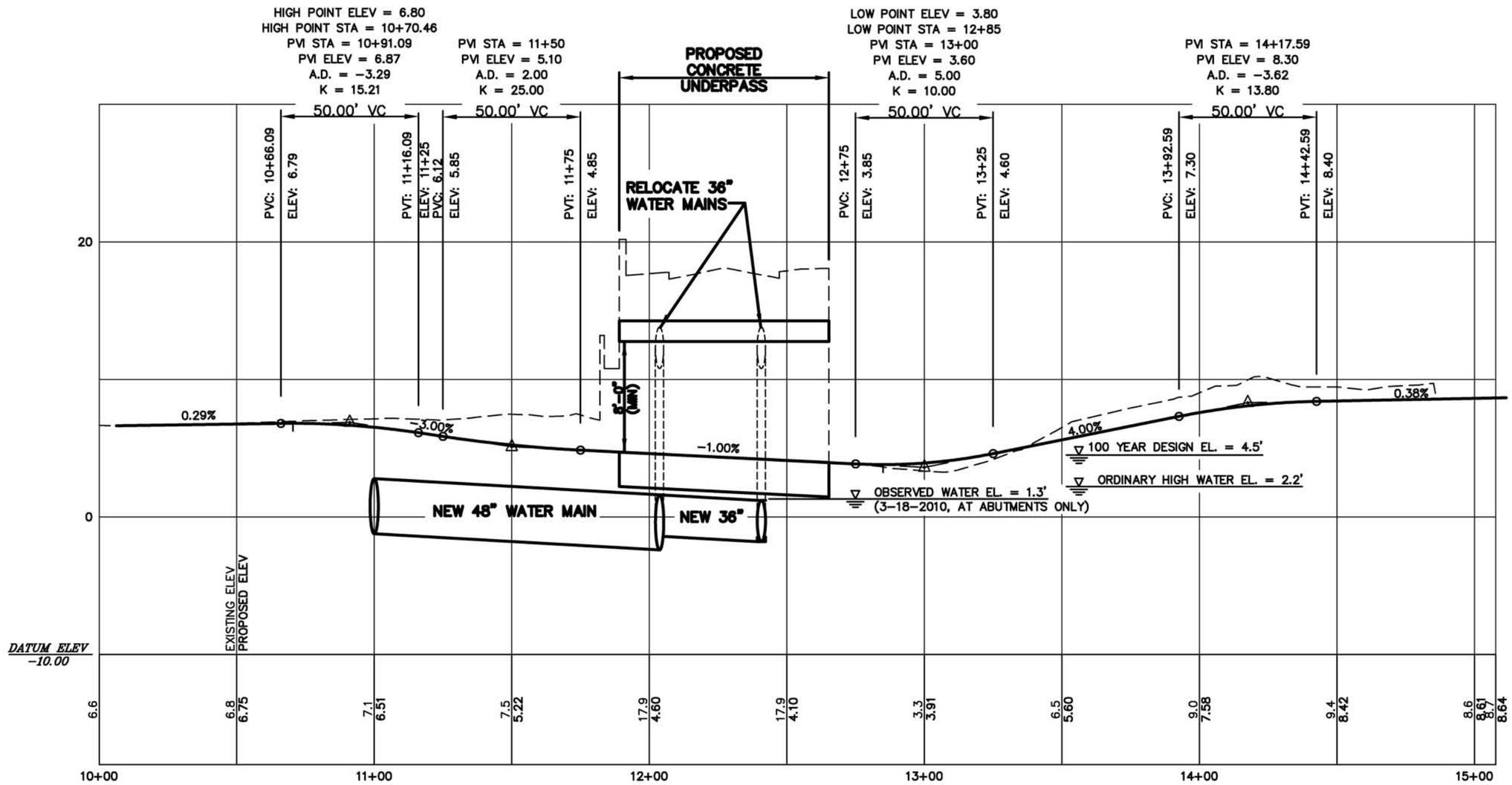
Downstream towards Boston

APPENDIX B

Figures 1 to 19



[Goodrl_c] – September 03, 2010 – 3:20pm – R:\VQ-081 Larz Anderson\Pedestrian Study\Drawings\Underpass Plan-1.dwg [FIGURE 1]



HORIZONTAL
40 0 40 80

VERTICAL
SCALE IN FEET
8 0 8 16

ENGINEERS FST since 1954
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

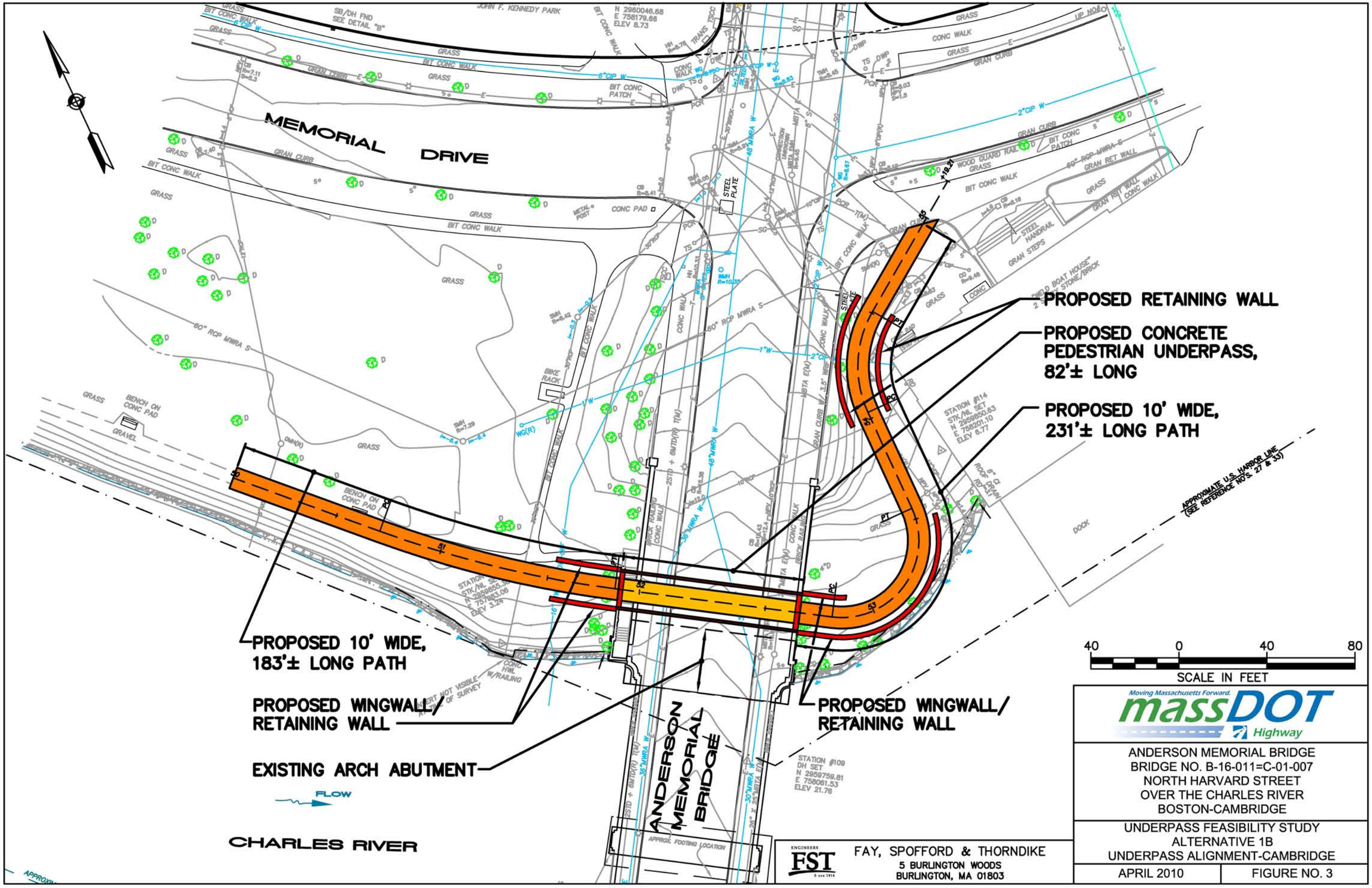
Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 1A
UNDERPASS PROFILE-CAMBRIDGE

APRIL 2010 | FIGURE NO. 2

[Goodrl_C] – September 03, 2010 – 3:22pm – R:\VQ-081 Larz Anderson\Pedestrian Study\Drawings\Underpass Profiles.dwg [North Underpass-A]



Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 1B
UNDERPASS ALIGNMENT-CAMBRIDGE

APRIL 2010 | FIGURE NO. 3

ENGINEERS FST since 1914
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

[Goodrl_C] – September 03, 2010 – 3:21pm – R:\VQ-081 Larz Anderson\Pedestrian Study\Drawings\Underpass Plan-2.dwg [FIGURE 3]

HIGH POINT ELEV = 6.62
HIGH POINT STA = 50+07.01
PVI STA = 50+29.29
PVI ELEV = 6.69
A.D. = −5.29
K = 9.46
50.00' VC

PVI STA = 51+64.86
PVI ELEV = −0.09
A.D. = 4.00
K = 12.50
50.00' VC

PROPOSED CONCRETE UNDERPASS

LOW POINT ELEV = −1.14
LOW POINT STA = 52+74.30
PVI STA = 52+90.97
PVI ELEV = −1.35
A.D. = 6.00
K = 8.33
50.00' VC

PVI STA = 54+88.81
PVI ELEV = 8.54
A.D. = −4.62
K = 10.81
50.00' VC

PVC: 50+04.29 ELEV: 6.62
PVT: 50+54.29 ELEV: 5.44
PVC: 51+39.86 ELEV: 1.16
PVT: 51+89.86 ELEV: −0.34
PVC: 52+65.97 ELEV: −1.10
PVT: 53+15.97 ELEV: −0.10
PVC: 54+63.81 ELEV: 7.29
PVT: 55+13.81 ELEV: 8.64

20
0

RETAIN 36" WATER MAINS

8'-0" (MIN)

−5.00%
−1.00%
5.00%
0.38%

▽ OBSERVED WATER EL. = 1.3'
(3−18−2010, AT ABUTMENTS ONLY)

▽ 100 YEAR DESIGN EL. = 4.5'
▽ ORDINARY HIGH WATER EL. = 2.2'

EXISTING ELEV
PROPOSED ELEV

DATUM ELEV
−10.00

6.6	6.8	5.64	7.2	3.15	7.1	0.69	18.2	−0.44	18.3	−0.94	3.0	−0.75	5.2	1.60	8.5	4.10	9.4	6.60	8.6	8.50	8.7		

50+00 51+00 52+00 53+00 54+00 55+00

HORIZONTAL
40 0 40 80
8 0 8 16
VERTICAL
SCALE IN FEET

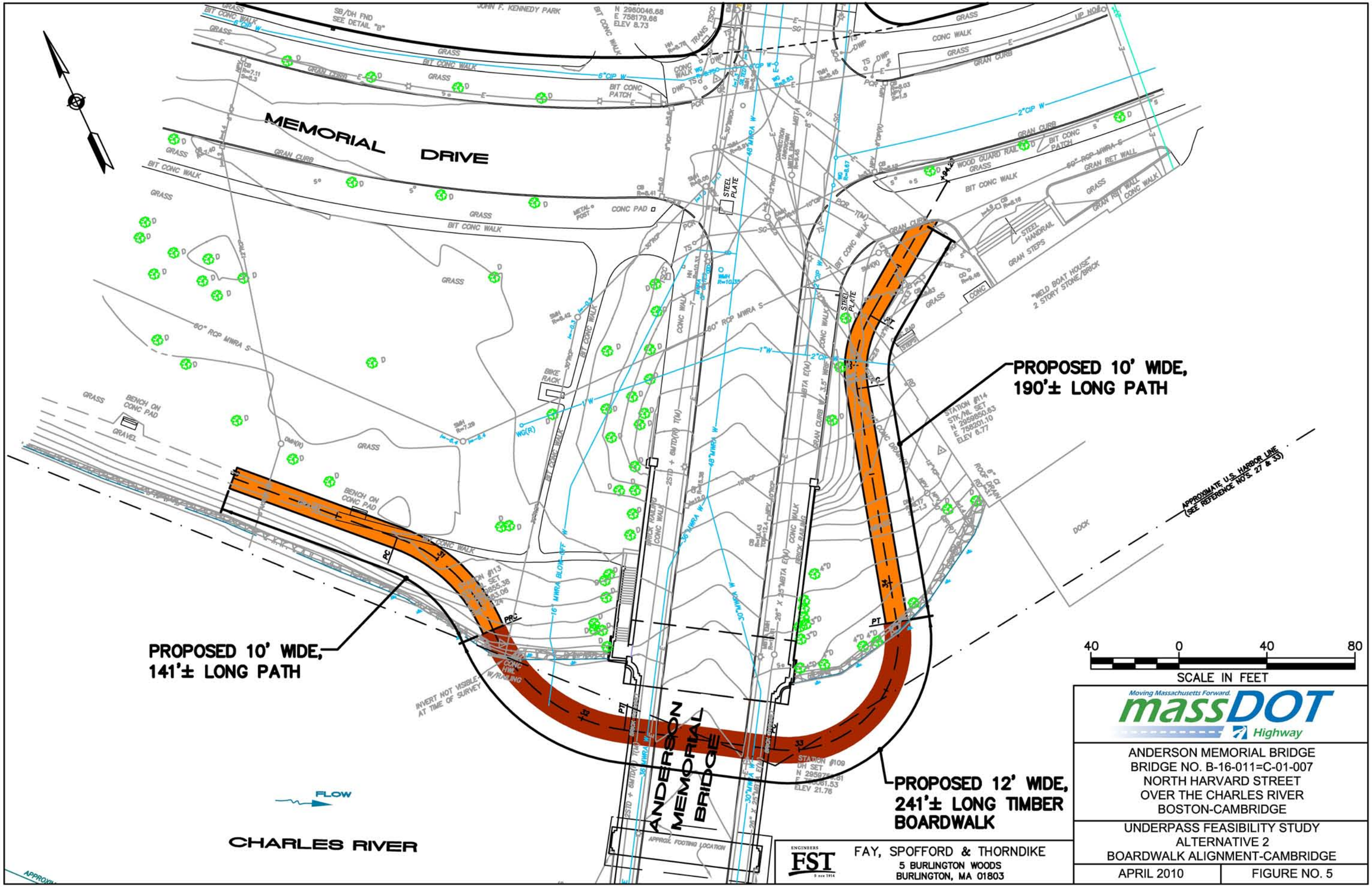
ENGINEERS FST since 1914
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 1B
UNDERPASS PROFILE-CAMBRIDGE

APRIL 2010 | FIGURE NO. 4



Moving Massachusetts Forward. massDOT Highway

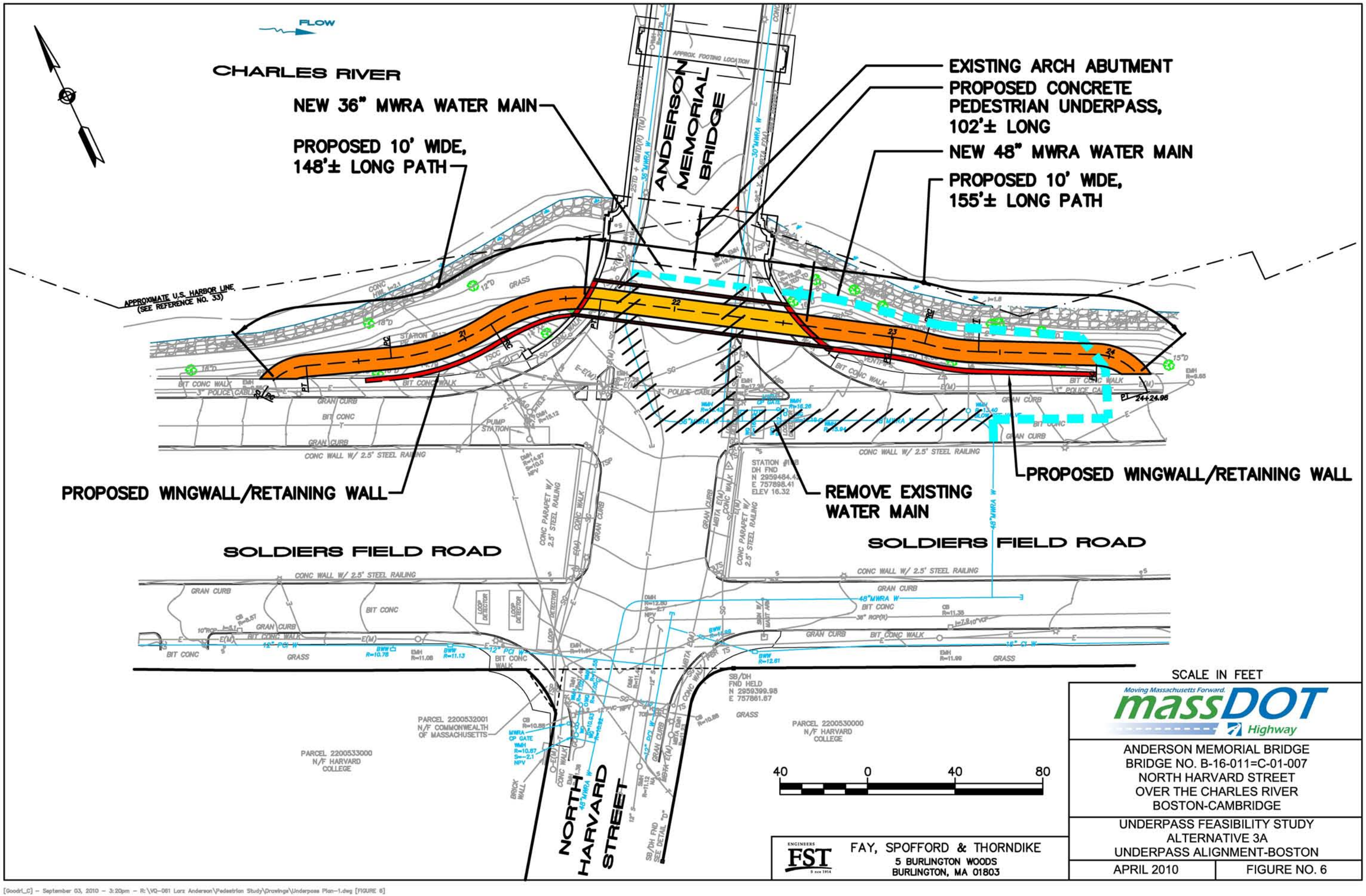
ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 2
BOARDWALK ALIGNMENT-CAMBRIDGE

APRIL 2010 | FIGURE NO. 5

ENGINEERS FST 9 AUG 1954
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

[Goodrl_C] – September 03, 2010 – 3:22pm – R:\VQ-081 Larz Anderson\Pedestrian Study\Drawings\Underpass Plan-Boardwalk.dwg [FIGURE 5]



SCALE IN FEET

Moving Massachusetts Forward. massDOT Highway

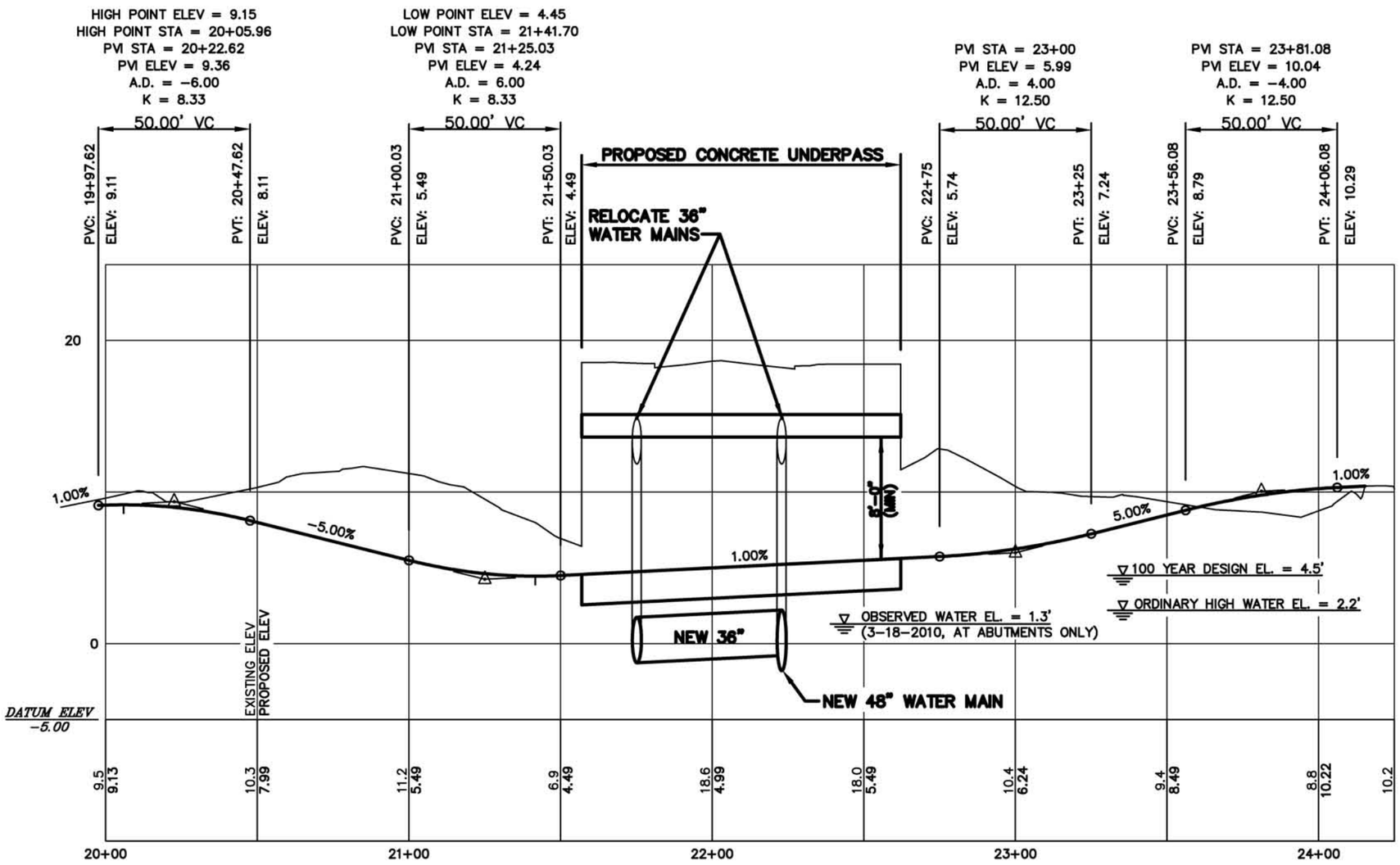
ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 3A
UNDERPASS ALIGNMENT-BOSTON

APRIL 2010 | FIGURE NO. 6

ENGINEERS FST since 1914
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

[Goodrl_C] – September 03, 2010 – 3:20pm – R:\VQ-081 Larz Anderson\Pedestrian Study\Drawings\Underpass Plan-1.dwg [FIGURE 6]



HORIZONTAL
40 0 40 80

VERTICAL
8 0 8 16
SCALE IN FEET

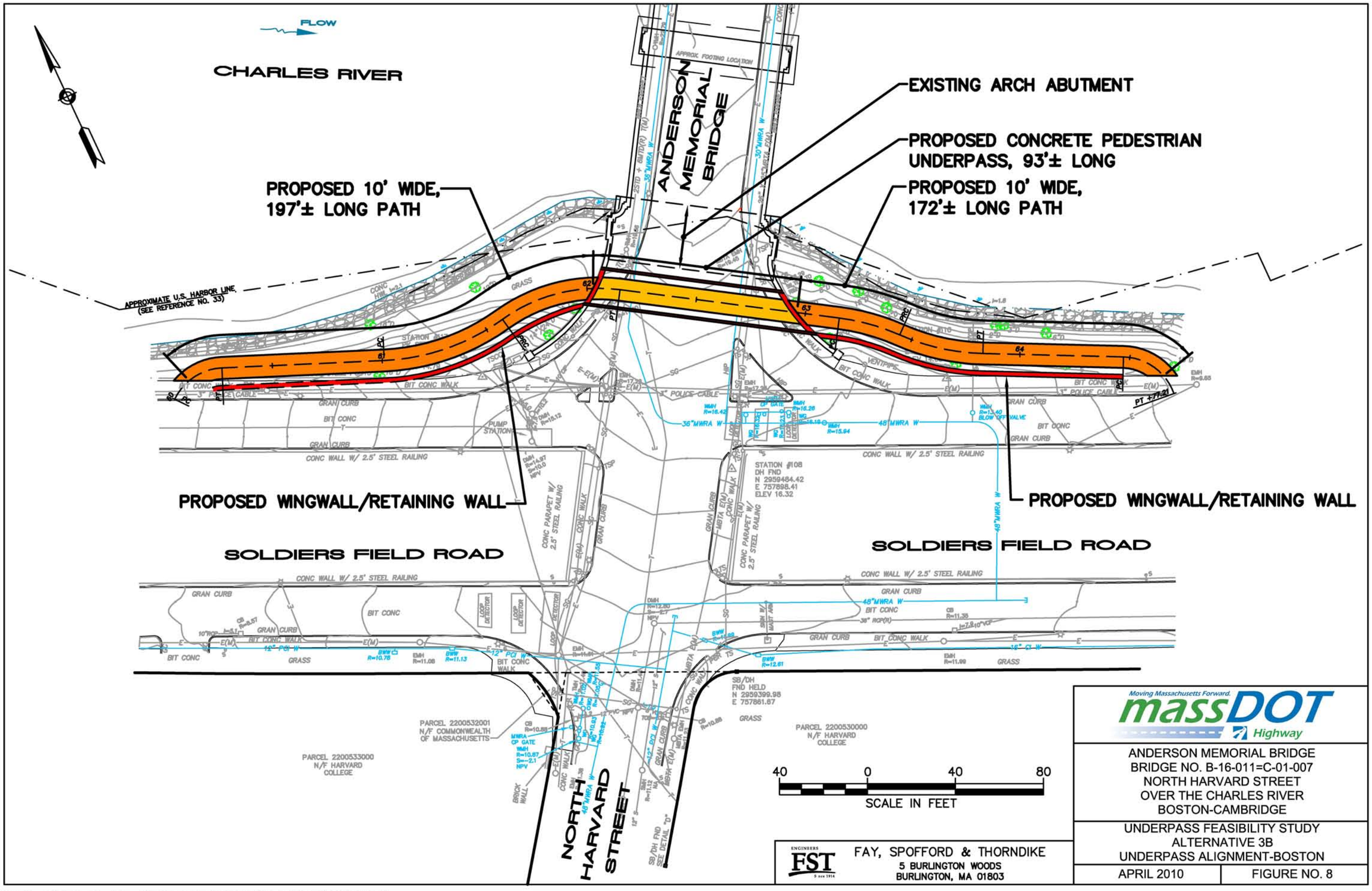
Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 3A
UNDERPASS PROFILE-BOSTON

APRIL 2010 | FIGURE NO. 7

ENGINEERS FST since 1914
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803



ENGINEERS FST

FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

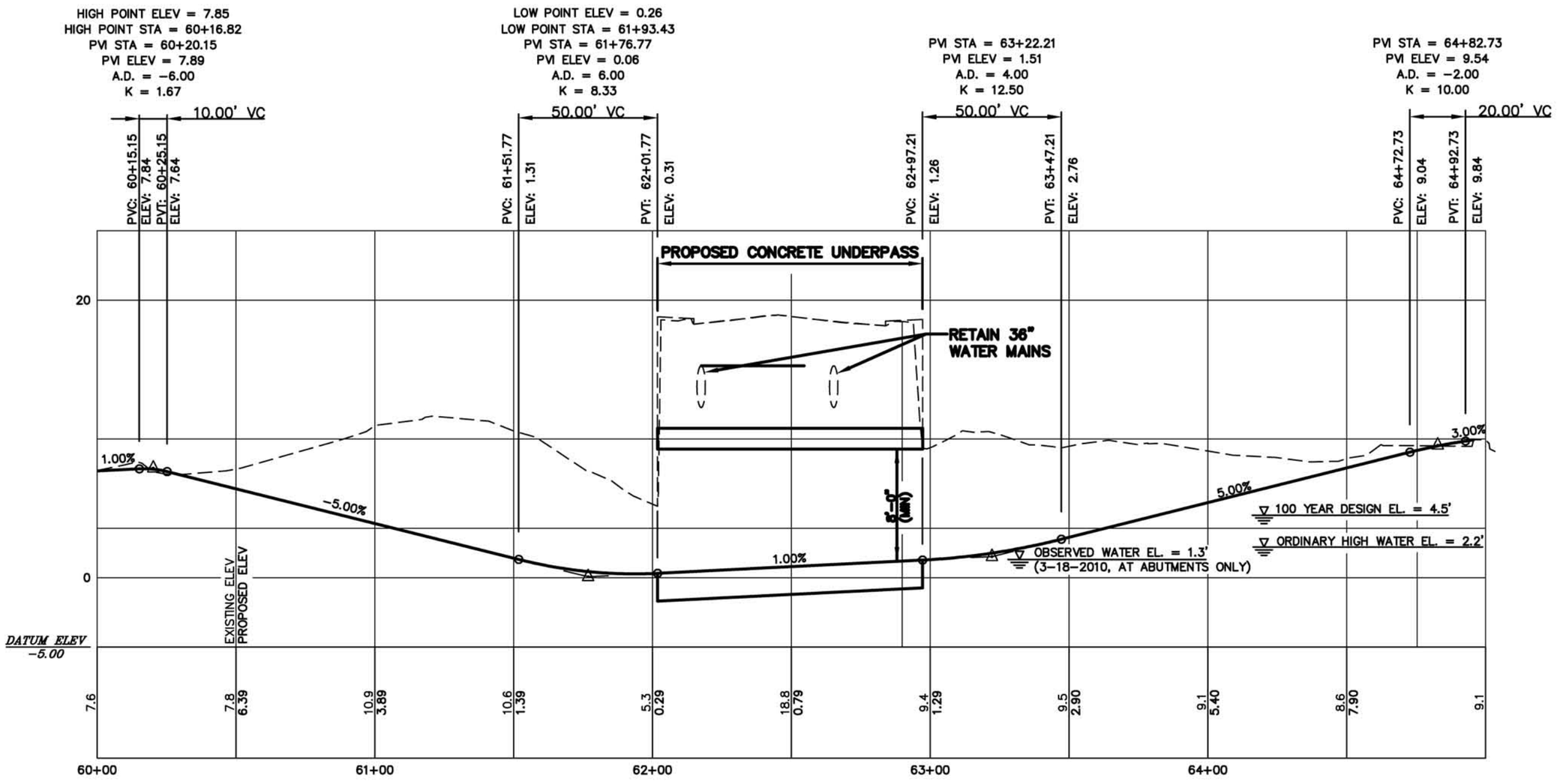
Moving Massachusetts Forward. massDOT Highway

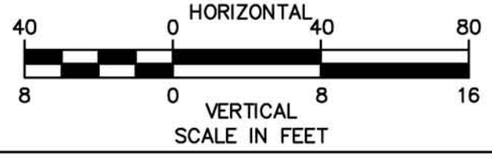
ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 3B
UNDERPASS ALIGNMENT-BOSTON

APRIL 2010 | FIGURE NO. 8

[Goodrl_C] – September 03, 2010 – 3:21pm – R:\VQ-061 Larz Anderson\Pedestrian Study\Drawings\Underpass Plan-2.dwg [FIGURE 8]





FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 3B
UNDERPASS PROFILE-BOSTON

APRIL 2010 | FIGURE NO. 9

FLOW

CHARLES RIVER

ANDERSON MEMORIAL BRIDGE

PROPOSED 12' WIDE, 320'± LONG TIMBER BOARDWALK

PROPOSED 10' WIDE, 84'± LONG PATH

PROPOSED 10' WIDE, 70'± LONG PATH

APPROXIMATE U.S. HARBOR LINE (SEE REFERENCE NO. 33)

PROPOSED RETAINING WALL

PROPOSED RETAINING WALL

SOLDIERS FIELD ROAD

SOLDIERS FIELD ROAD

NORTH HARVARD STREET

PARCEL 2200533000
N/F HARVARD COLLEGE

PARCEL 2200532001
N/F COMMONWEALTH OF MASSACHUSETTS

PARCEL 2200530000
N/F HARVARD COLLEGE

STATION #108
DH FND
N 2959484.42
E 757898.41
ELEV 16.32

SB/DH
FND HELD
N 2959399.98
E 757861.67

40 0 40 80
SCALE IN FEET

Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

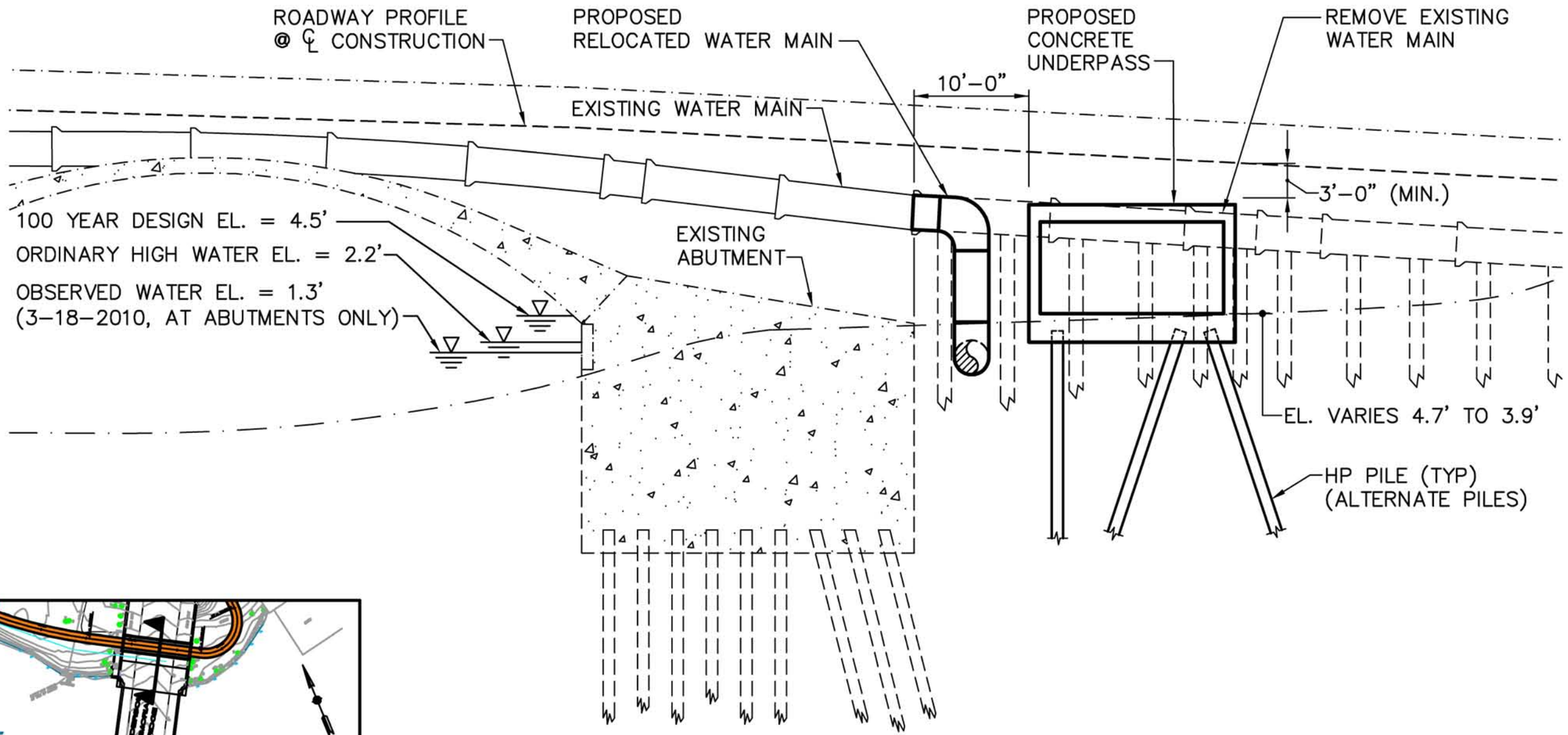
UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 4
BOARDWALK ALIGNMENT-BOSTON

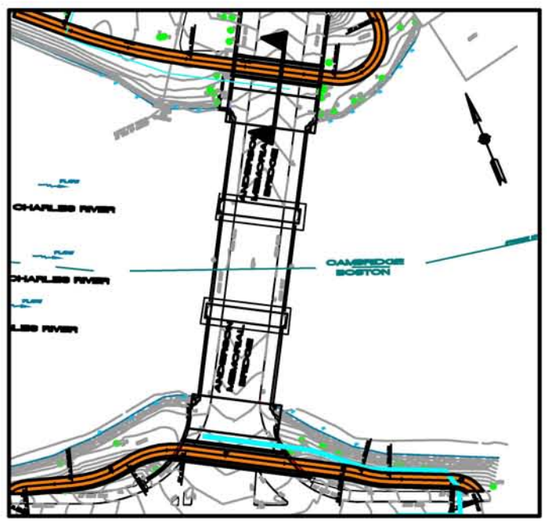
APRIL 2010 | FIGURE NO. 10

ENGINEERS FST since 1914

FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

[Goodrl_C] – September 03, 2010 – 3:21pm – R:\VQ-061 Larz Anderson\Pedestrian Study\Drawings\Underpass Plan-Boardwalk.dwg [FIGURE 10]





ALTERNATIVE 1A UNDERPASS WITH RELOCATED WATER MAIN – CAMBRIDGE

SCALE: 1"=10'

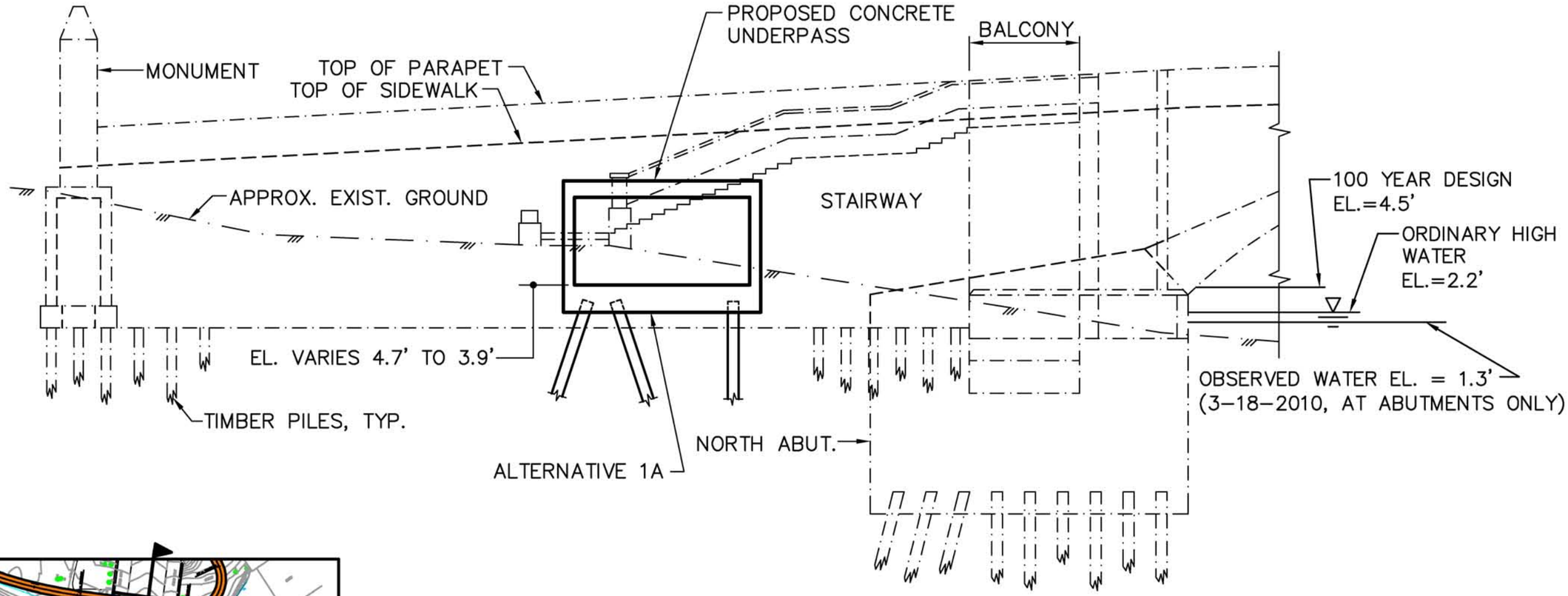
Moving Massachusetts Forward. massDOT Highway

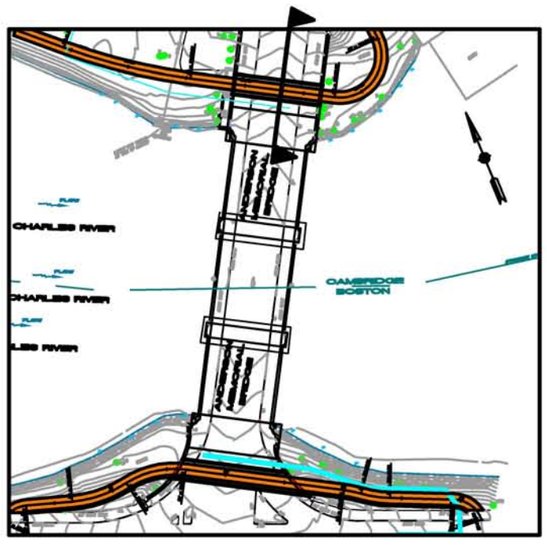
ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 1A
LONGITUDINAL SECTION

APRIL 2010 | FIGURE NO. 11

ENGINEERS FST 1914
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803





ALTERNATIVE 1A UNDERPASS AT NORTHWEST STAIRS WEST ELEVATION – CAMBRIDGE

SCALE: 1"=10'

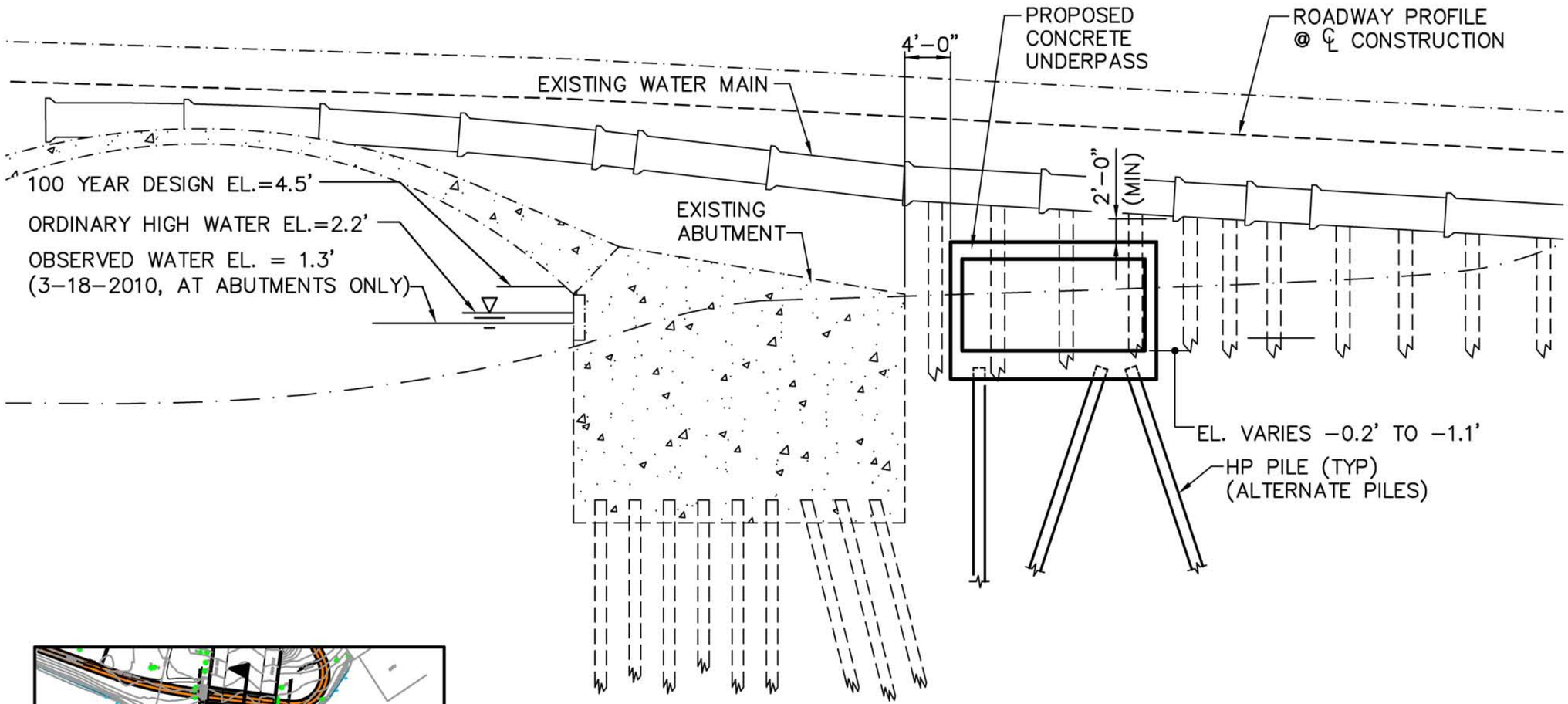
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

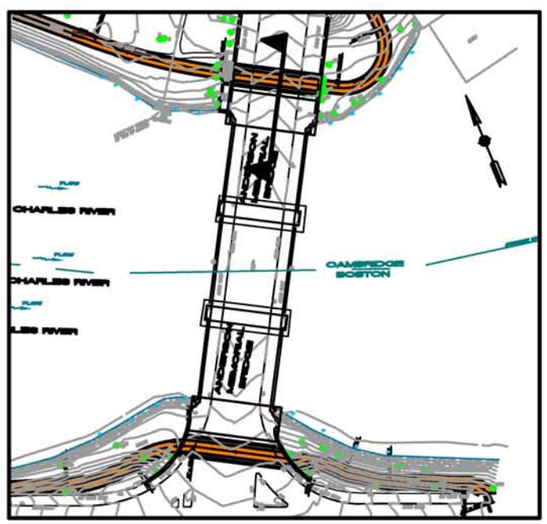
Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 1A
ELEVATION

APRIL 2010 | FIGURE NO. 12





ALTERNATIVE 1B UNDERPASS
BELOW WATER MAIN – CAMBRIDGE

SCALE: 1"=10'

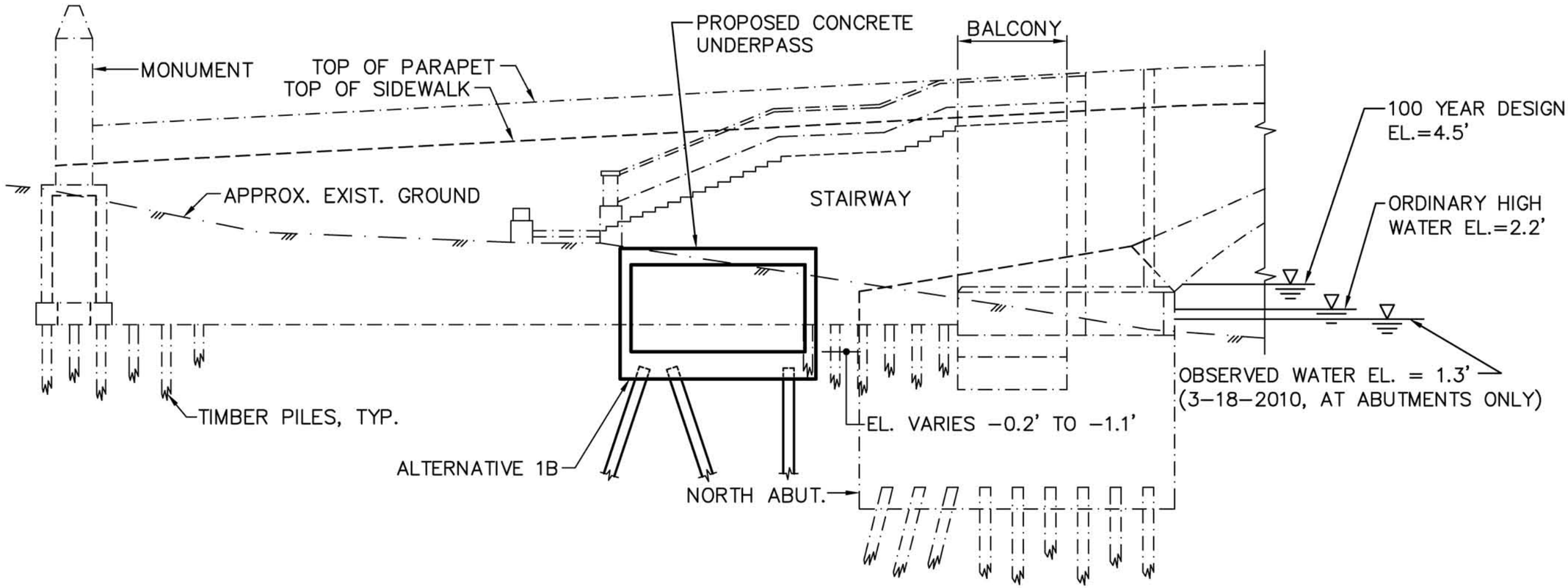
Moving Massachusetts Forward. massDOT Highway

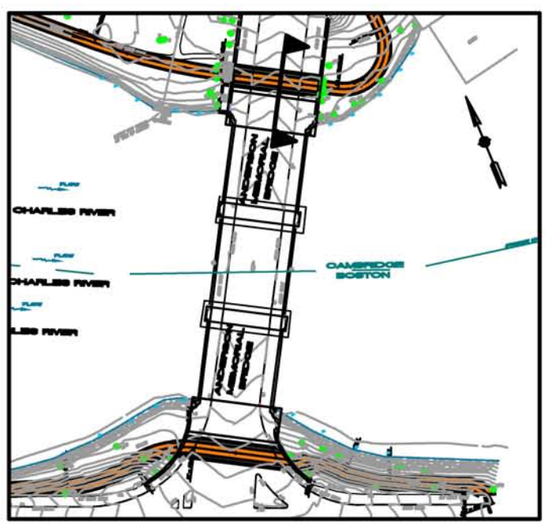
ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 1B
LONGITUDINAL SECTION

APRIL 2010 | FIGURE NO. 13

ENGINEERS FST since 1914
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803





ALTERNATIVE 1B UNDERPASS AT NORTHWEST STAIRS WEST ELEVATION – CAMBRIDGE

SCALE: 1"=10'

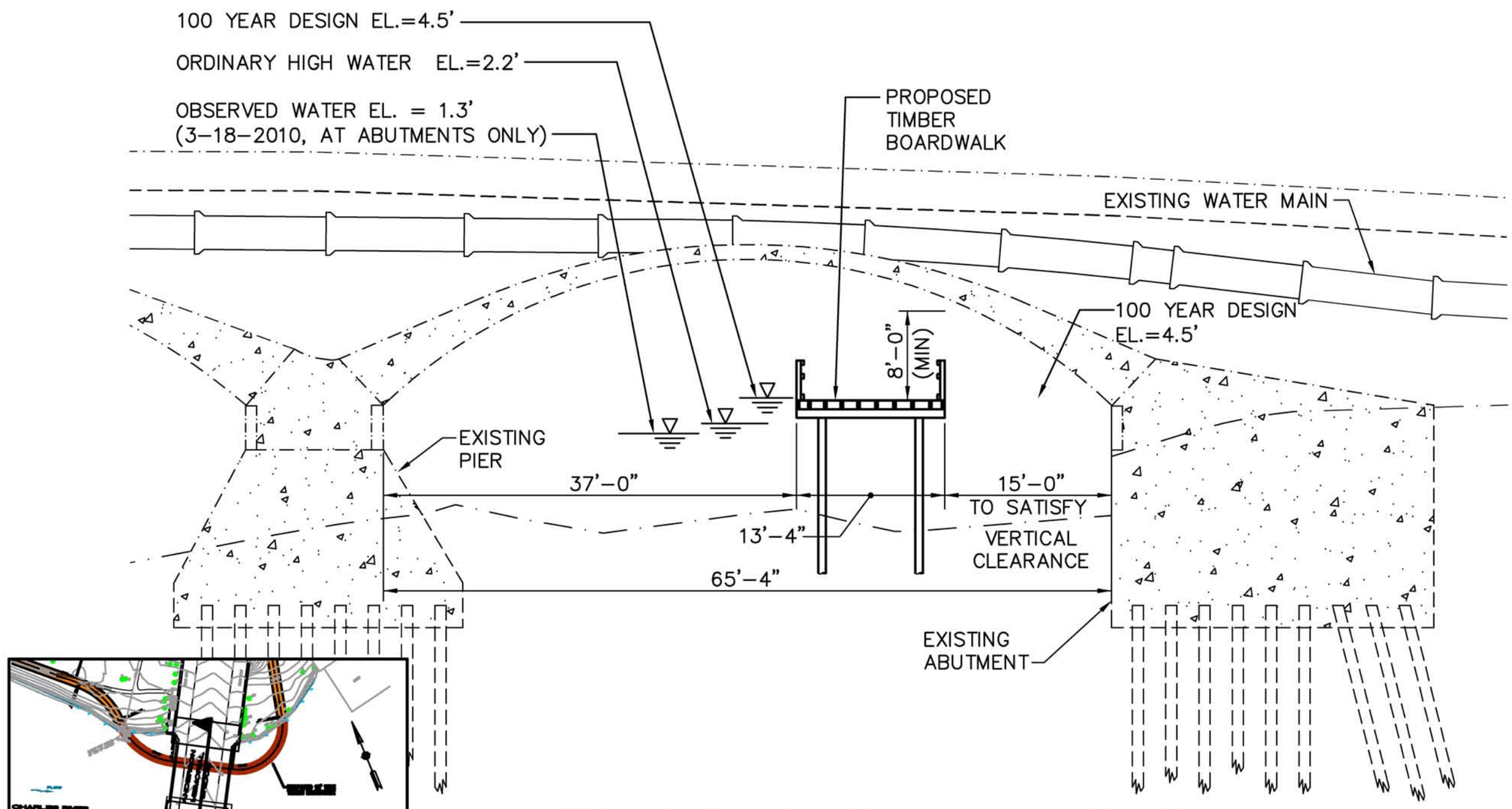
ENGINEERS FST since 1914
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

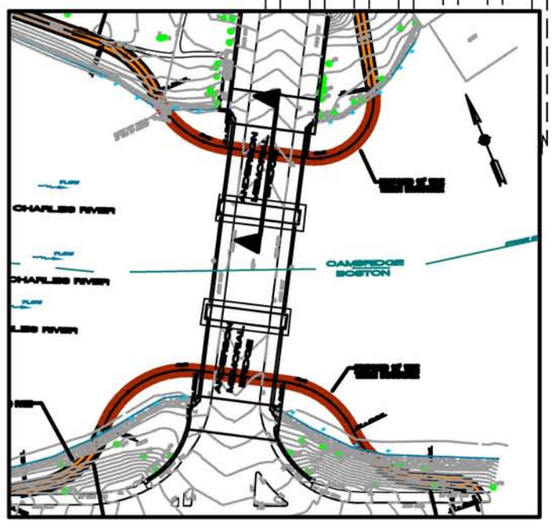
Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 1B
ELEVATION

APRIL 2010 | FIGURE NO. 14





ALTERNATIVE 2 BOARDWALK –CAMBRIDGE

SCALE: 1"=10'

NOTE:
ALTERNATIVE 2 AT CAMBRIDGE APPROACH IS SHOWN. ALTERNATIVE 4 AT BOSTON APPROACH IS SIMILAR AND OPPOSITE IMAGE.

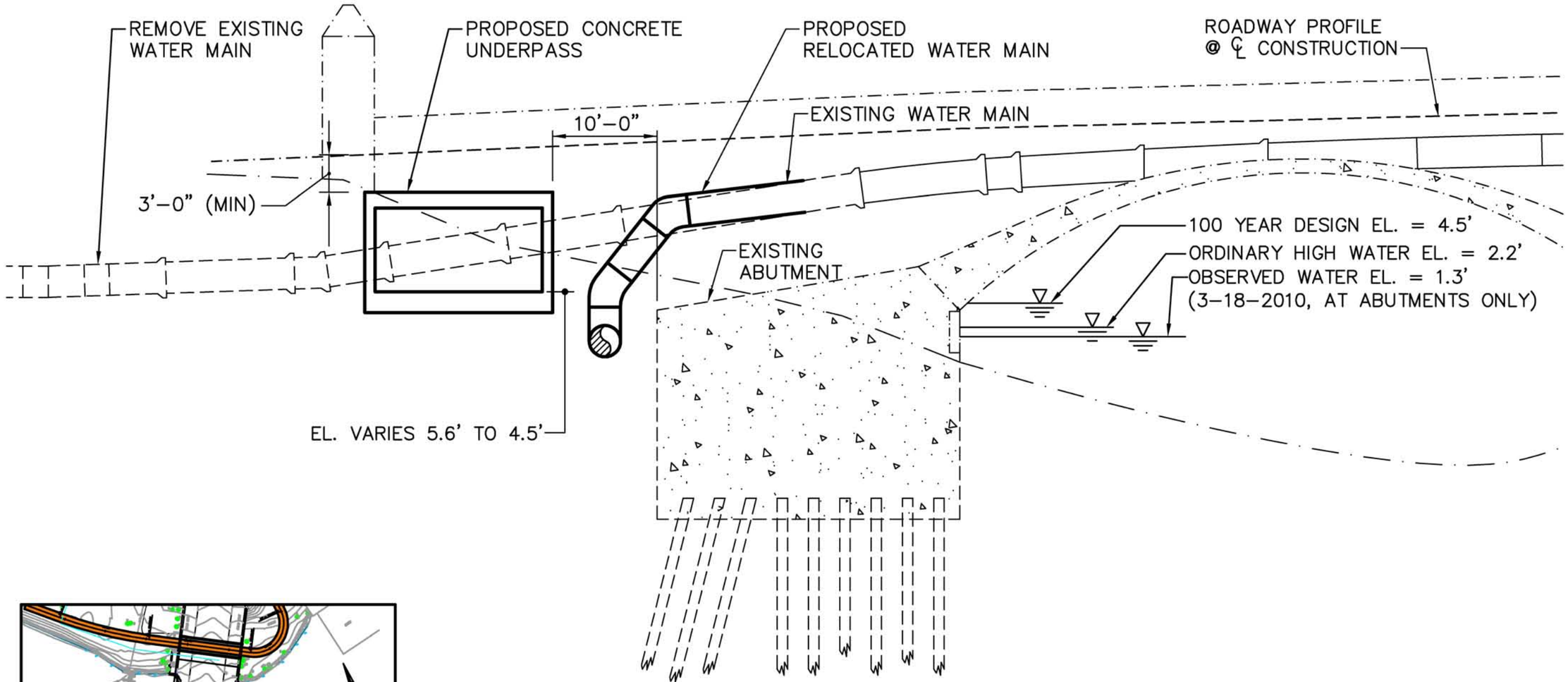
ENGINEERS FST since 1934
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

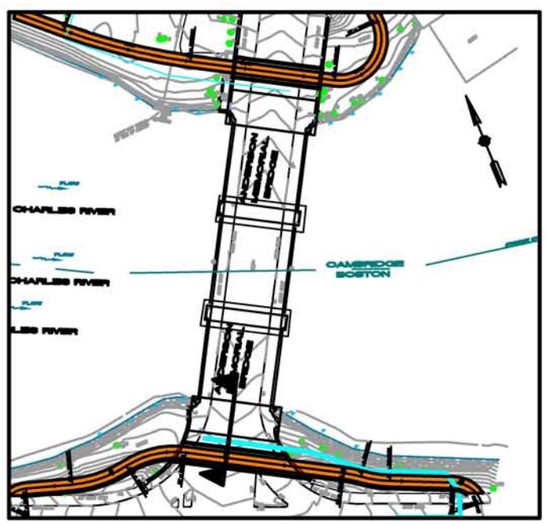
Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 2
LONGITUDINAL SECTION

APRIL 2010 | FIGURE NO. 15





ALTERNATIVE 3A UNDERPASS WITH RELOCATED WATER MAIN – BOSTON

SCALE: 1"=10'

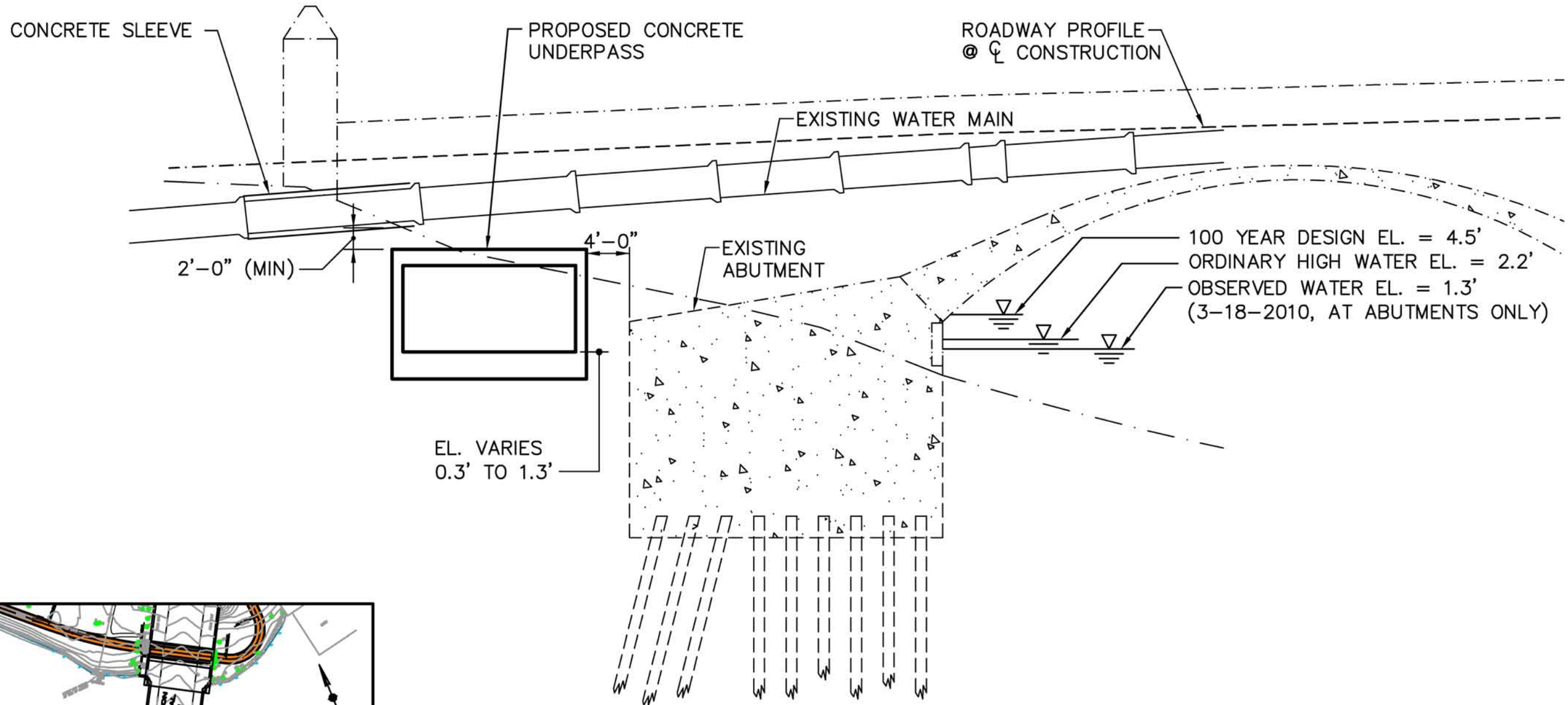
Moving Massachusetts Forward. massDOT Highway

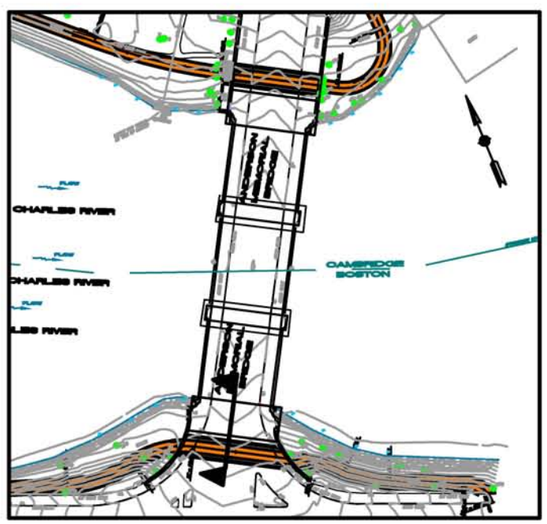
ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 3A
LONGITUDINAL SECTION

APRIL 2010 | FIGURE NO. 16

ENGINEERS FST Since 1914
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803





ALTERNATIVE 3B UNDERPASS BELOW WATER MAIN – BOSTON

SCALE: 1"=10'

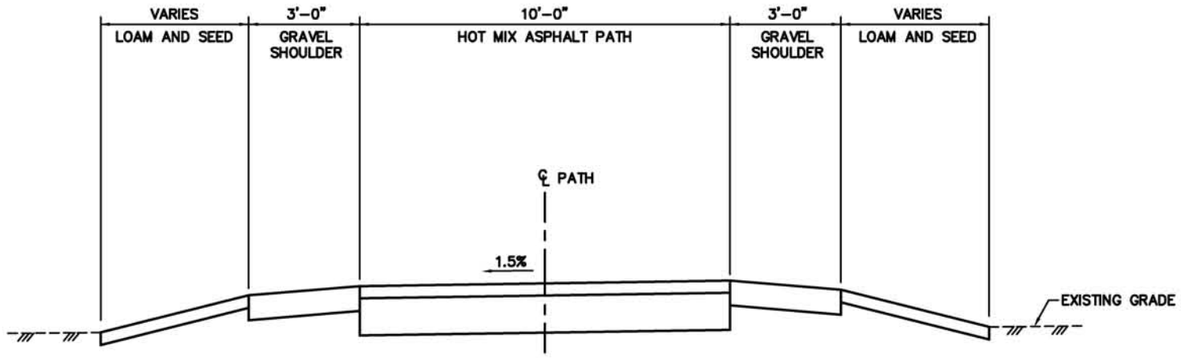
Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY
ALTERNATIVE 3B
LONGITUDINAL SECTION

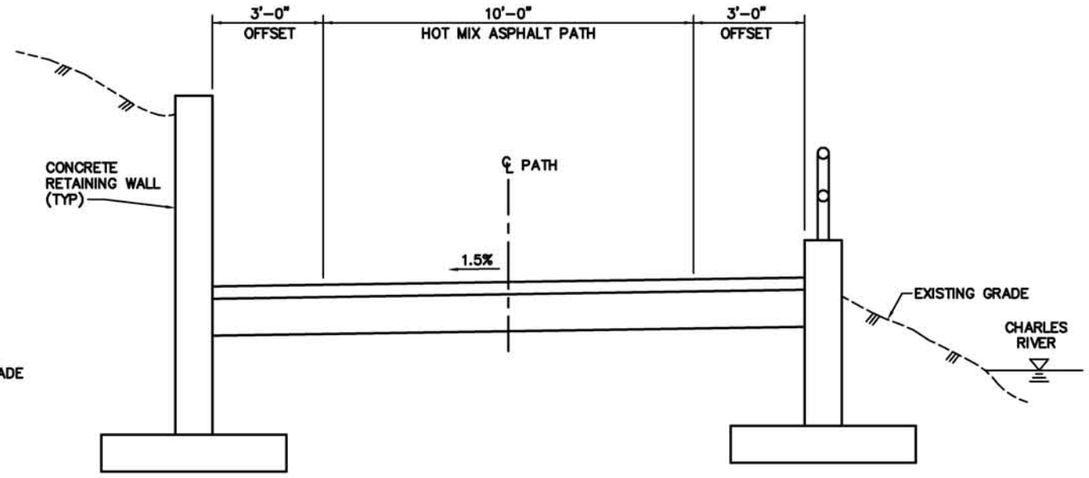
APRIL 2010 | FIGURE NO. 17

ENGINEERS FST since 1914
FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803



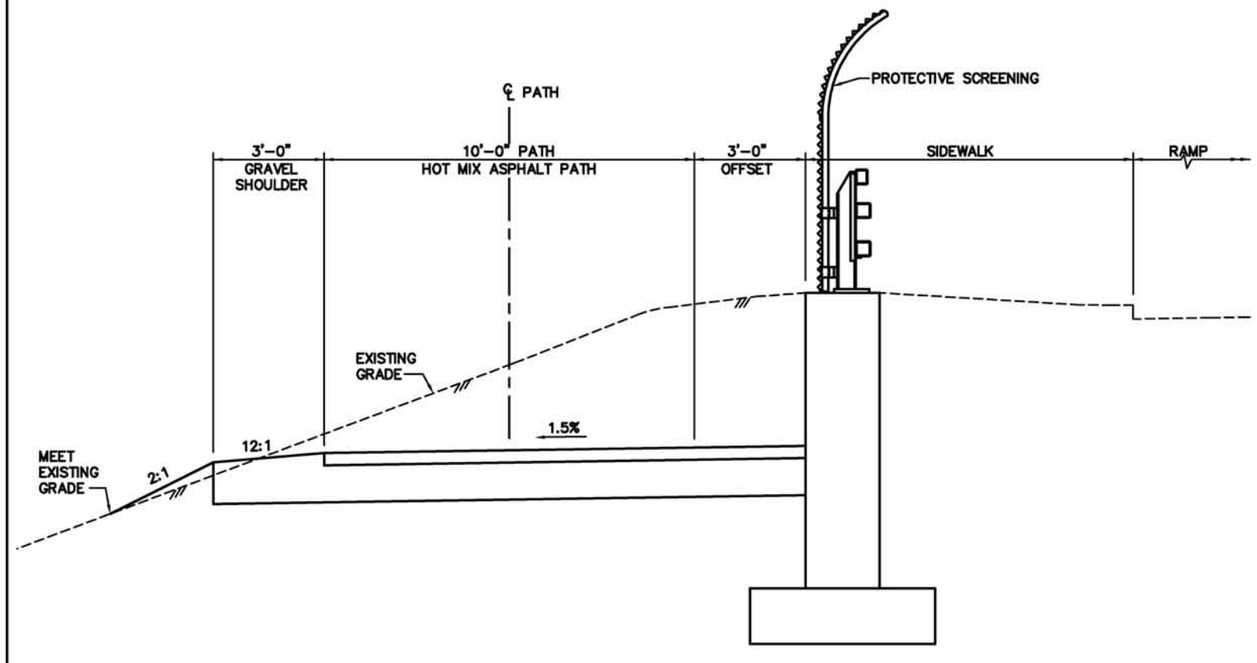
MULTI–USE PATH FILL SECTION

SCALE: 1/4"=1'–0"



MULTI–USE PATH CUT SECTION

SCALE: 1/4"=1'–0"



MULTI–USE PATH WITH RETAINING WALL

SCALE: 1/4"=1'–0"

ENGINEERS FST Since 1914

FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

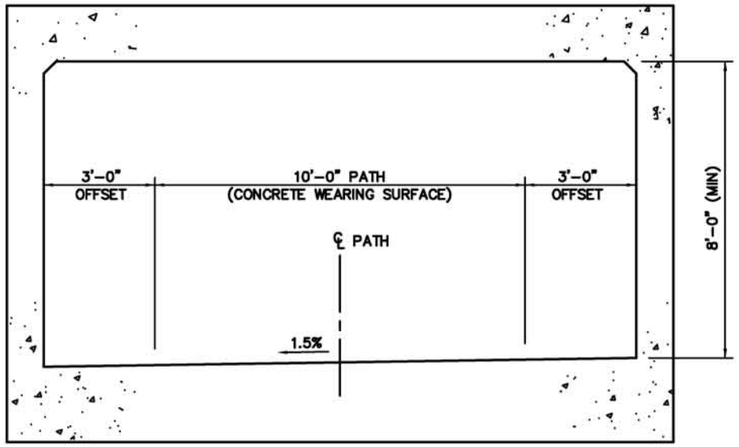
Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY

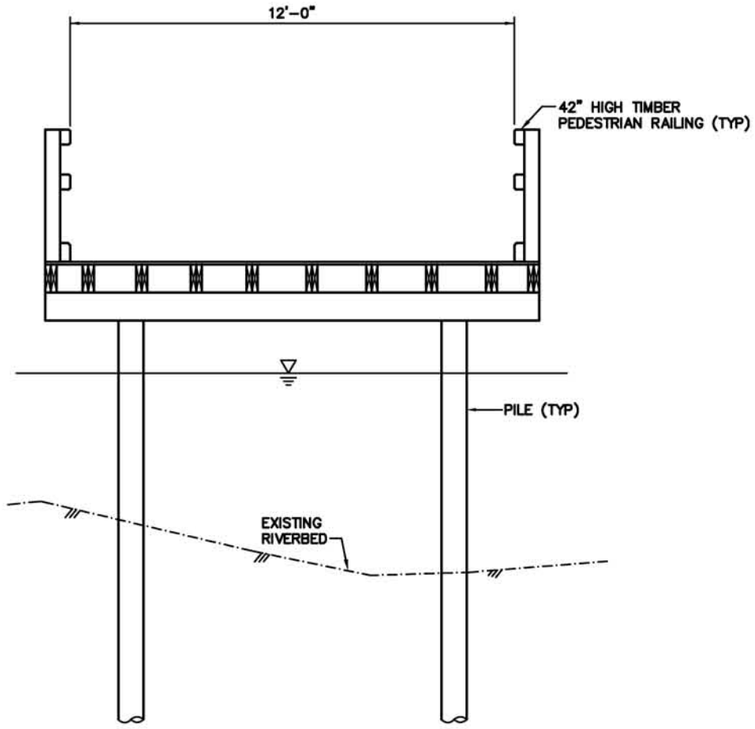
TYPICAL SECTIONS - I

APRIL 2010 | FIGURE NO. 18



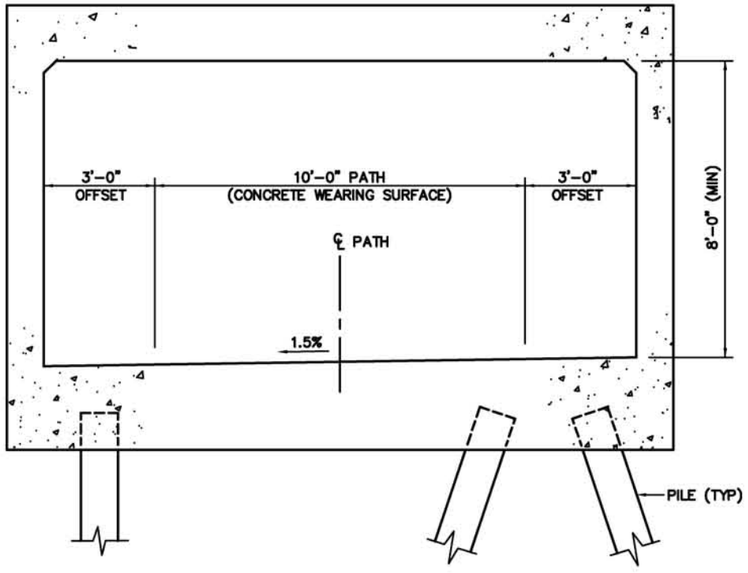
TYPICAL CONCRETE UNDERPASS SECTION – BOSTON

SCALE: 1/4"=1'–0"



TYPICAL TIMBER BOARDWALK SECTION

SCALE: 1/4"=1'–0"



TYPICAL CONCRETE UNDERPASS SECTION – CAMBRIDGE

SCALE: 1/4"=1'–0"

Moving Massachusetts Forward. massDOT Highway

ANDERSON MEMORIAL BRIDGE
BRIDGE NO. B-16-011=C-01-007
NORTH HARVARD STREET
OVER THE CHARLES RIVER
BOSTON-CAMBRIDGE

UNDERPASS FEASIBILITY STUDY

TYPICAL SECTIONS - II

ENGINEERS FST since 1914

FAY, SPOFFORD & THORNDIKE
5 BURLINGTON WOODS
BURLINGTON, MA 01803

APRIL 2010 | FIGURE NO. 19

APPENDIX C

Cost Estimate

BIKE / PEDESTRIAN UNDERPASS FEASIBILITY STUDY
ANDERSON MEMORIAL BRIDGE, PROECT No. 605517
BOSTON / CAMBRIDGE
ESTIMATE OF QUANTITIES
PREPARED BY: FAY, SPOFFORD & THORNDIKE
SEPTEMBER 2, 2010

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ALT	ALTERNATIVE DESCRIPTION	TOTAL ESTIMATED CONSTRUCTION COST:	ANNUAL MAINT COST (2010 Values)
1A	Alternative 1A - Cambridge - Relocate Water Main with Concrete Underpass above Water Table	$2,400,000.00	$24,000.00
1B	Alternative 1B - Cambridge Side - Concrete Underpass **BELOW** Water Main	$2,335,000.00	$26,000.00
2	Alternative 2 - Cambridge Side - Boardwalk under North Arch	$1,170,000.00	$25,000.00
3A	Alternative 3A - Boston Side - Relocate Water Main with Concrete Underpass above Water Table	$2,850,000.00	$24,000.00
3B	Alternative 3B - Boston Side - Concrete Underpass **BELOW** Water Main	$2,945,000.00	$26,000.00
4	Alternative 4 - Boston Side - Boardwalk under South Arch with Retaining Walls	$1,760,000.00	$25,000.00

ANDERSON MEMORIAL BRIDGE, PROECT No. 605517
BOSTON / CAMBRIDGE
ESTIMATE OF QUANTITIES
PREPARED BY: FAY, SPOFFORD & THORNDIKE
SEPTEMBER 2, 2010

ALTERNATIVE 1A - CAMBRIDGE
CONCRETE UNDERPASS (RELOCATE MWRA WATER MAINS)

R:\VQ-061 Larz Anderson\Pedestrian Study\Documents\Underpass Feasibility Study\FINAL Underpass Feasibility Study Report_09-02-2010\Cost Estimate\[Final_Estimate_09-02-2010.xls]Summary

ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
BITUMINOUS PATH CONSTRUCTION				
EXCAVATION	CY	650	$30.00	$19,500.00
HOT MIX ASPHALT	TON	150	$100.00	$15,000.00
GRAVEL BORROW	CY	400	$30.00	$12,000.00
UTILITIES				
MWRA WATER MAIN RELOCATION (NEW 48")	FT	385	$1,200.00	$462,000.00
MWRA WATER MAIN RELOCATION (NEW 36")	FT	40	$820.00	$32,800.00
OTHER UTILITIES	LS	1	$20,000.00	$20,000.00
STRUCTURAL				
ABUTMENT BRACING & MONITORING DURING TUNNEL EXCAVATION	LS	1	$25,000.00	$25,000.00
SUPPORT OF EXCAVATION	SF	1,300	$50.00	$65,000.00
RETAINING WALL EXCAVATION	CY	600	$42.00	$25,200.00
STEEL HP PILES	FT	700	$200.00	$140,000.00
4000 PSI CONCRETE - CONCRETE UNDERPASS	CY	260	$1,200.00	$312,000.00
4000 PSI CONCRETE - CONCRETE WINGWALLS / RETAINING WALLS	CY	150	$800.00	$120,000.00
REINFORCING STEEL - CONCRETE UNDERPASS	LB	26,000	$3.50	$91,000.00
REINFORCING STEEL - CONCRETE WINGWALLS / RETAINING WALLS	LB	15,000	$3.50	$52,500.00
FLEXIBLE WATERPROOFING MEMBRANE	SY	530	$150.00	$79,500.00
SUMP AND DRAINAGE SYSTEM	LS	1	$130,000.00	$130,000.00
BRIDGE RAILING TYPE S3-TL4	FT			$0.00
BOARDWALK (WALKWAY SUPERSTRUCTURE AND PILE BENTS)	SF			$0.00
BOARDWALK (MINI PILES)	FT			$0.00
BOARDWALK (MOBILIZATION / SILT CONTROLS / BARGE)	LS			$0.00
LANDSCAPING/LIGHTING				
LIGHTING	LS	1	$15,000.00	$15,000.00
LANDSCAPING AND AMENITIES	LS	1	$100,000.00	$100,000.00
ESTIMATED POLICE ALLOWANCE	LS	1	$100,000.00	$100,000.00
			SUBTOTAL:	$1,816,500.00
			Construction Contingency (20%) :	$363,300.00
			TOTAL ESTIMATED CONSTRUCTION COST:	$2,179,800.00
			MassDOT Construction Administration Contingency (10%):	$217,980.00
			TOTAL ESTIMATED PROJECT COST:	**$2,397,780.00**
			Round up	**$2,398,000.00**
			SAY	**$2,400,000.00**

ESTIMATE MAINTENANCE COST	***Unit***	***#***	***Unit Cost***	
Snow Removal	***Ea***	***10***	***$500.00***	***$5,000.00***
Lighting	***LS***	***1***	***$2,000.00***	***$2,000.00***
Landscaping Say 2 times/month over 8 months	***Ea***	***16***	***$500.00***	***$8,000.00***
Maintain Drainage, sweeping, cleaning - say twice a year	***Ea***	***2***	***$1,000.00***	***$2,000.00***
SUMP & PUMPING SYSTEM	***LS***	***1***	***$2,000.00***	***$2,000.00***
Misc (repairs, inspections, etc.)	***LS***	***1***	***$5,000.00***	***$5,000.00***
			TOTAL	***$24,000.00***
			SAY	$24,000.00

BIKE / PEDESTRIAN UNDERPASS FEASIBILITY STUDY
ANDERSON MEMORIAL BRIDGE, PROECT No. 605517
BOSTON / CAMBRIDGE
ESTIMATE OF QUANTITIES
PREPARED BY: FAY, SPOFFORD & THORNDIKE
SEPTEMBER 2, 2010

ALTERNATIVE 1B - CAMBRIDGE
CONCRETE UNDERPASS (MAINTAIN MWRA WATER MAINS)

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ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
BITUMINOUS PATH CONSTRUCTION				
EXCAVATION	CY	1,000	$30.00	$30,000.00
HOT MIX ASPHALT	TON	150	$100.00	$15,000.00
GRAVEL BORROW	CY	400	$30.00	$12,000.00
UTILITIES				
MWRA WATER MAIN RELOCATION (NEW 48")	FT			$0.00
MWRA WATER MAIN RELOCATION (NEW 36")	FT			$0.00
OTHER UTILITIES	LS	1	$20,000.00	$20,000.00
STRUCTURAL				
ABUTMENT BRACING & MONITORING DURING TUNNEL EXCAVATION	LS	1	$50,000.00	$50,000.00
SUPPORT OF EXCAVATION	SF	3,000	$50.00	$150,000.00
RETAINING WALL EXCAVATION	CY	1,250	$42.00	$52,500.00
STEEL HP PILES	FT	900	$200.00	$180,000.00
4000 PSI CONCRETE - CONCRETE UNDERPASS	CY	260	$1,200.00	$312,000.00
4000 PSI CONCRETE - CONCRETE WINGWALLS / RETAINING WALLS	CY	350	$800.00	$280,000.00
REINFORCING STEEL - CONCRETE UNDERPASS	LB	26,000	$3.50	$91,000.00
REINFORCING STEEL - CONCRETE WINGWALLS / RETAINING WALLS	LB	35,000	$3.50	$122,500.00
FLEXIBLE WATERPROOFING MEMBRANE	SY	530	$150.00	$79,500.00
SUMP AND DRAINAGE SYSTEM	LS	1	$160,000.00	$160,000.00
BRIDGE RAILING TYPE S3-TL4	FT			$0.00
BOARDWALK (WALKWAY SUPERSTRUCTURE AND PILE BENTS)	SF			$0.00
BOARDWALK (MINI PILES)	FT			$0.00
BOARDWALK (MOBILIZATION / SILT CONTROLS / BARGE)	LS			$0.00
LANDSCAPING/LIGHTING				
LIGHTING	LS	1	$15,000.00	$15,000.00
LANDSCAPING AND AMENITIES	LS	1	$100,000.00	$100,000.00
ESTIMATED POLICE ALLOWANCE	LS	1	$100,000.00	$100,000.00
			SUBTOTAL:	$1,769,500.00
			Construction Contingency (20%) :	$353,900.00
			TOTAL ESTIMATED CONSTRUCTION COST:	$2,123,400.00
			MassDOT Construction Administration Contingency (10%):	$212,340.00
			TOTAL ESTIMATED PROJECT COST:	**$2,335,740.00**
			Round up	**$2,335,800.00**
			SAY	**$2,335,000.00**

ESTIMATE MAINTENANCE COST	*Unit*	*#*	*Unit Cost*		
Snow Removal	***Ea***	***10***	***$500.00***	***$5,000.00***	
Lighting	***LS***	***1***	***$2,000.00***	***$2,000.00***	
Landscaping Say 2 times/month over 8 months	***Ea***	***16***	***$500.00***	***$8,000.00***	
Maintain Drainage, sweeping, cleaning - say twice a year	***Ea***	***2***	***$1,000.00***	***$2,000.00***	
SUMP & PUMPING SYSTEM	***LS***	***1***	***$4,000.00***	***$4,000.00***	
Misc (repairs, inspections, etc.)	***LS***	***1***	***$5,000.00***	***$5,000.00***	
			TOTAL	***$26,000.00***	
				SAY	$26,000.00

BIKE / PEDESTRIAN UNDERPASS FEASIBILITY STUDY
ANDERSON MEMORIAL BRIDGE, PROECT No. 605517
BOSTON / CAMBRIDGE
ESTIMATE OF QUANTITIES
PREPARED BY: FAY, SPOFFORD & THORNDIKE
SEPTEMBER 2, 2010

ALTERNATIVE 2 - CAMBRIDGE
TIMBER BOARDWALK

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ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
BITUMINOUS PATH CONSTRUCTION				
EXCAVATION	CY	350	$30.00	$10,500.00
HOT MIX ASPHALT	TON	100	$100.00	$10,000.00
GRAVEL BORROW	CY	250	$30.00	$7,500.00
UTILITIES				
MWRA WATER MAIN RELOCATION (NEW 48")	FT			$0.00
MWRA WATER MAIN RELOCATION (NEW 36")	FT			$0.00
OTHER UTILITIES	LS	1	$20,000.00	$20,000.00
STRUCTURAL				
ABUTMENT BRACING & MONITORING DURING TUNNEL EXCAVATION	LS		$25,000.00	$0.00
SUPPORT OF EXCAVATION	SF		$50.00	$0.00
RETAINING WALL EXCAVATION	CY		$42.00	$0.00
STEEL HP PILES	FT		$200.00	$0.00
4000 PSI CONCRETE - CONCRETE UNDERPASS	CY		$1,200.00	$0.00
4000 PSI CONCRETE - CONCRETE WINGWALLS / RETAINING WALLS	CY		$800.00	$0.00
REINFORCING STEEL - CONCRETE UNDERPASS	LB		$3.50	$0.00
REINFORCING STEEL - CONCRETE WINGWALLS / RETAINING WALLS	LB		$3.50	$0.00
FLEXIBLE WATERPROOFING MEMBRANE	SY		$150.00	$0.00
SUMP AND DRAINAGE SYSTEM	LS		$130,000.00	$0.00
BRIDGE RAILING TYPE S3-TL4	FT			$0.00
BOARDWALK (WALKWAY SUPERSTRUCTURE AND PILE BENTS)	SF	4,000	$70.00	$280,000.00
BOARDWALK (MINI PILES)	FT	2,430	$110.00	$267,300.00
BOARDWALK (MOBILIZATION / SILT CONTROLS / BARGE)	LS	1	$75,000.00	$75,000.00
LANDSCAPING/LIGHTING				
LIGHTING	LS	1	$15,000.00	$15,000.00
LANDSCAPING AND AMENITIES	LS	1	$100,000.00	$100,000.00
ESTIMATED POLICE ALLOWANCE	LS	1	$100,000.00	$100,000.00
			SUBTOTAL:	$885,300.00
			Construction Contingency (20%) :	$177,060.00
			TOTAL ESTIMATED CONSTRUCTION COST:	$1,062,360.00
			MassDOT Construction Administration Contingency (10%):	$106,236.00
			TOTAL ESTIMATED PROJECT COST:	**$1,168,596.00**
			Round up	**$1,169,000.00**
			SAY	**$1,170,000.00**

ESTIMATE MAINTENANCE COST	***Unit***	***#***	***Unit Cost***	
Snow Removal	***Ea***	***10***	***$500.00***	***$5,000.00***
Lighting	***LS***	***1***	***$2,000.00***	***$2,000.00***
Landscaping Say 2 times/month over 8 months	***Ea***	***16***	***$500.00***	***$8,000.00***
Maintain Drainage, sweeping, cleaning - say twice a year	***Ea***	***2***	***$1,000.00***	***$2,000.00***
Misc (repairs, inspections, etc.)	***LS***	***1***	***$8,000.00***	***$8,000.00***
			TOTAL	***$25,000.00***
			SAY	***$25,000.00***

BIKE / PEDESTRIAN UNDERPASS FEASIBILITY STUDY
ANDERSON MEMORIAL BRIDGE, PROECT No. 605517
BOSTON / CAMBRIDGE
ESTIMATE OF QUANTITIES
PREPARED BY: FAY, SPOFFORD & THORNDIKE
SEPTEMBER 2, 2010

ALTERNATIVE 3A - BOSTON
CONCRETE UNDERPASS (RELOCATE MWRA WATER MAINS)

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ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
BITUMINOUS PATH CONSTRUCTION				
EXCAVATION	CY	1,200	$30.00	$36,000.00
HOT MIX ASPHALT	TON	75	$100.00	$7,500.00
GRAVEL BORROW	CY	200	$30.00	$6,000.00
UTILITIES				
MWRA WATER MAIN RELOCATION (NEW 48")	FT	270	$1,200.00	$324,000.00
MWRA WATER MAIN RELOCATION (NEW 36")	FT	50	$820.00	$41,000.00
OTHER UTILITIES	LS	1	$20,000.00	$20,000.00
STRUCTURAL				
ABUTMENT BRACING & MONITORING DURING TUNNEL EXCAVATION	LS	1	$25,000.00	$25,000.00
SUPPORT OF EXCAVATION	SF	3,500	$50.00	$175,000.00
RETAINING WALL EXCAVATION	CY	650	$42.00	$27,300.00
STEEL HP PILES	FT	575	$200.00	$115,000.00
4000 PSI CONCRETE - CONCRETE UNDERPASS	CY	300	$1,200.00	$360,000.00
4000 PSI CONCRETE - CONCRETE WINGWALLS / RETAINING WALLS	CY	300	$800.00	$240,000.00
REINFORCING STEEL - CONCRETE UNDERPASS	LB	30,000	$3.50	$105,000.00
REINFORCING STEEL - CONCRETE WINGWALLS / RETAINING WALLS	LB	30,000	$3.50	$105,000.00
FLEXIBLE WATERPROOFING MEMBRANE	SY	650	$150.00	$97,500.00
SUMP AND DRAINAGE SYSTEM	LS	1	$130,000.00	$130,000.00
BRIDGE RAILING TYPE S3-TL4	FT	310	$415.00	$128,650.00
BOARDWALK (WALKWAY SUPERSTRUCTURE AND PILE BENTS)	SF			$0.00
BOARDWALK (MINI PILES)				
BOARDWALK (MOBILIZATION / SILT CONTROLS / BARGE)				
LANDSCAPING/LIGHTING				
LIGHTING	LS	1	$15,000.00	$15,000.00
LANDSCAPING AND AMENITIES	LS	1	$100,000.00	$100,000.00
ESTIMATED POLICE ALLOWANCE	LS	1	$100,000.00	$100,000.00
			SUBTOTAL:	$2,157,950.00
			Construction Contingency (20%) :	$431,590.00
			TOTAL ESTIMATED CONSTRUCTION COST:	$2,589,540.00
			MassDOT Construction Administration Contingency (10%):	$258,954.00
			TOTAL ESTIMATED PROJECT COST:	**$2,848,494.00**
			Round up	**$2,849,000.00**
			SAY	**$2,850,000.00**

ANNUAL Maintenance (lighting, electrical, landscaping, snowremoval, drainage system. (same as Alt 1A) $24,000.00

BIKE / PEDESTRIAN UNDERPASS FEASIBILITY STUDY
ANDERSON MEMORIAL BRIDGE, PROECT No. 605517
BOSTON / CAMBRIDGE
ESTIMATE OF QUANTITIES
PREPARED BY: FAY, SPOFFORD & THORNDIKE
SEPTEMBER 2, 2010

ALTERNATIVE 3B - BOSTON
CONCRETE UNDERPASS (MAINTAIN MWRA WATER MAINS)

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ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
BITUMINOUS PATH CONSTRUCTION				
EXCAVATION	CY	2,000	$30.00	$60,000.00
HOT MIX ASPHALT	TON	75	$100.00	$7,500.00
GRAVEL BORROW	CY	200	$30.00	$6,000.00
UTILITIES				
MWRA WATER MAIN RELOCATION (NEW 48")	FT			$0.00
MWRA WATER MAIN RELOCATION (NEW 36")	FT			$0.00
OTHER UTILITIES	LS	1	$20,000.00	$20,000.00
STRUCTURAL				
ABUTMENT BRACING & MONITORING DURING TUNNEL EXCAVATION	LS	1	$50,000.00	$50,000.00
SUPPORT OF EXCAVATION	SF	6,000	$50.00	$300,000.00
RETAINING WALL EXCAVATION	CY	1,100	$42.00	$46,200.00
STEEL HP PILES	FT	750	$200.00	$150,000.00
4000 PSI CONCRETE - CONCRETE UNDERPASS	CY	300	$1,200.00	$360,000.00
4000 PSI CONCRETE - CONCRETE WINGWALLS / RETAINING WALLS	CY	430	$800.00	$344,000.00
REINFORCING STEEL - CONCRETE UNDERPASS	LB	30,000	$3.50	$105,000.00
REINFORCING STEEL - CONCRETE WINGWALLS / RETAINING WALLS	LB	43,000	$3.50	$150,500.00
FLEXIBLE WATERPROOFING MEMBRANE	SY	650	$150.00	$97,500.00
SUMP AND DRAINAGE SYSTEM	LS	1	$160,000.00	$160,000.00
BRIDGE RAILING TYPE S3-TL4	FT	380	$415.00	$157,700.00
BOARDWALK (WALKWAY SUPERSTRUCTURE AND PILE BENTS)	SF			$0.00
BOARDWALK (MINI PILES)				
BOARDWALK (MOBILIZATION / SILT CONTROLS / BARGE)				
LANDSCAPING/LIGHTING				
LIGHTING	LS	1	$15,000.00	$15,000.00
LANDSCAPING AND AMENITIES	LS	1	$100,000.00	$100,000.00
ESTIMATED POLICE ALLOWANCE	LS	1	$100,000.00	$100,000.00
			SUBTOTAL:	$2,229,400.00
			Construction Contingency (20%) :	$445,880.00
			TOTAL ESTIMATED CONSTRUCTION COST:	$2,675,280.00
			MassDOT Construction Administration Contingency (10%):	$267,528.00
			TOTAL ESTIMATED PROJECT COST:	**$2,942,808.00**
			Round up	**$2,943,000.00**
			SAY	**$2,945,000.00**

ANNUAL Maintenance (lighting, electrical, landscaping, snowremoval, drainage system. (**same as Alt 1B**) $26,000.00

BIKE / PEDESTRIAN UNDERPASS FEASIBILITY STUDY
ANDERSON MEMORIAL BRIDGE, PROECT No. 605517
BOSTON / CAMBRIDGE
ESTIMATE OF QUANTITIES
PREPARED BY: FAY, SPOFFORD & THORNDIKE
SEPTEMBER 2, 2010

ALTERNATIVE 4 - BOSTON
TIMBER BOARDWALK

R:\VQ-061 Larz Anderson\Pedestrian Study\Documents\Underpass Feasibility Study\FINAL Underpass Feasibility Study Report_09-02-2010\Cost Estimate\[Final_Estimate_09-02-2010.xls]Summary

ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
BITUMINOUS PATH CONSTRUCTION				
EXCAVATION	CY	250	$30.00	$7,500.00
HOT MIX ASPHALT	TON	60	$100.00	$6,000.00
GRAVEL BORROW	CY	150	$30.00	$4,500.00
UTILITIES				
MWRA WATER MAIN RELOCATION (NEW 48")	FT			$0.00
MWRA WATER MAIN RELOCATION (NEW 36")	FT			$0.00
OTHER UTILITIES	LS	1	$20,000.00	$20,000.00
STRUCTURAL				
ABUTMENT BRACING & MONITORING DURING TUNNEL EXCAVATION	LS		$50,000.00	$0.00
SUPPORT OF EXCAVATION	SF	300	$50.00	$15,000.00
RETAINING WALL EXCAVATION	CY	650	$42.00	$27,300.00
STEEL HP PILES	FT		$200.00	$0.00
4000 PSI CONCRETE - CONCRETE UNDERPASS	CY		$1,200.00	$0.00
4000 PSI CONCRETE - CONCRETE RETAINING WALLS	CY	250	$800.00	$200,000.00
REINFORCING STEEL - CONCRETE UNDERPASS	LB		$3.50	$0.00
REINFORCING STEEL - CONCRETE RETAINING WALLS	LB	25,000	$3.50	$87,500.00
FLEXIBLE WATERPROOFING MEMBRANE	SY		$150.00	$0.00
SUMP AND DRAINAGE SYSTEM	LS		$160,000.00	$0.00
BRIDGE RAILING TYPE S3-TL4	FT	190	$415.00	$78,850.00
BOARDWALK (WALKWAY SUPERSTRUCTURE AND PILE BENTS)	SF	4,420	$70.00	$309,400.00
BOARDWALK (MINI PILES)	FT	2,610	$110.00	$287,100.00
BOARDWALK (MOBILIZATION / SILT CONTROLS / BARGE)	LS	1	$75,000.00	$75,000.00
LANDSCAPING/LIGHTING				
LIGHTING	LS	1	$15,000.00	$15,000.00
LANDSCAPING AND AMENITIES	LS	1	$100,000.00	$100,000.00
ESTIMATED POLICE ALLOWANCE	LS	1	$100,000.00	$100,000.00
			SUBTOTAL:	$1,333,150.00
			Construction Contingency (20%) :	$266,630.00
			TOTAL ESTIMATED CONSTRUCTION COST:	$1,599,780.00
			MassDOT Construction Administration Contingency (10%):	$159,978.00
			TOTAL ESTIMATED PROJECT COST:	**$1,759,758.00**
			Round up	**$1,760,000.00**
			SAY	**$1,760,000.00**

ANNUAL Maintenance (lighting, electrical, landscaping, snowremoval, drainage system. (same as **Alt 2**) $25,000.00

APPENDIX D

Comparison Table

Summary of Evaluated Elements

Note: all date are preliminary and reflect 10% design information.

	At-Grade Crossing/Rehabilitation Project	Tunnel Underpass	Boardwalk
Element Evaluated			
Feasibility			
	The proposed rehabilitation of the Anderson Memorial Bridge will include improvements at the signalized roadway crossings for pedestrians, as well as bicycle and vehicular traffic.	Feasible, but have adverse impacts to the historical integrity of the bridge and the surrounding area, with associated risks to the project schedule.	Feasible, but have adverse impacts to the historical integrity of the bridge and the surrounding area, with associated risks to the project schedule
Ped/ Bike/ Connectivity			
	The proposed rehabilitation of the Anderson Memorial Bridge will include improvements at the signalized roadway crossings for pedestrians, as well as bicycle and vehicular traffic.	Provides un-interrupted pedestrian and bicycle crossing.	Provides un-interrupted pedestrian and bicycle crossing.
Utility Impacts			
	Negligible.	Impact to MWRA Water main can be mitigated at a cost.	Negligible.
Effects on Cultural Resources			
	No Averse Effect is anticipated.	Adverse Effect is anticipated from each Boston and Cambridge underpasses.	Adverse Effect from each Boston and Cambridge boardwalks.

	At-Grade Crossing/Rehabilitation Project	Tunnel Underpass	Boardwalk
Element Evaluated			
Security and Surveillance			
	No negative impact due to general visibility of crossings.	Hidden. Need for added police/security patrols and/or surveillance of the access and paths by the responsible agency or city.	Hidden. Need for added police & security patrols and/or surveillance of the access and paths by the responsible agency or city.
Impact to Navigation & Rowers			
	No negative impact.	No negative impact.	Negative impact. Restricts boat navigation and use by rowers at the End Channels.
Schedule			
	No negative impact.	Negative impact to design and permitting schedule.	Negative impact to design and permitting schedule.

APPENDIX E

Correspondence

Deval L. Patrick, Governor
Timothy P. Murray, Lt. Governor
Jeffrey B. Mullan, Secretary & CEO
Luisa Paiewonsky, Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

August 26, 2010

RE: BOSTON/CAMBRIDGE—(MassDOT# 605517)
Bridge Rehabilitation Project, North Harvard Street over the Charles River
Anderson Memorial Bridge (MHC# CAM.926/MassDOT# B-16-011=C-01-007)
Addendum to the Early Environmental Coordination Letter

Ms. Brona Simon, Executive Director
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

Dear Ms. Simon:

The Massachusetts Department of Transportation (MassDOT) is proposing to rehabilitate the Anderson Memorial Bridge, which carries North Harvard Street over the Charles River between Boston and Cambridge. Constructed in 1915, the Anderson Memorial Bridge is a three-span concrete arch structure with ornamental brick facing. The bridge is listed in the State and National Registers of Historic Places as a contributing structure within the Charles River Basin Historic District. It is anticipated that this project will be supported exclusively by the state-funded Accelerated Bridge Program (ABP) and will require review, therefore, under M.G.L. Chapter 9, Sections 26-27C as amended by Chapter 254 of the Acts of 1988. This letter is an addendum to the early coordination letter sent to the Massachusetts Historical Commission on February 22, 2010.

MassDOT currently is exploring the feasibility of constructing pedestrian/bicycle underpasses through the wingwalls of the Anderson Memorial Bridge along both sides of the Charles River. The proposed underpasses would enhance public safety and convenience by allowing pedestrians and cyclists to proceed under North Harvard Street along proposed new multi-use path extensions and avoid crossing the heavily congested intersections at either end of the bridge.

The proposed underpasses, which would consist of either precast or cast-in-place concrete boxes, would have a minimal vertical clearance of 8' and a width of approximately 16' to comply with

AASHTO standards. An engineering study, performed by F.S. & T. for MassDOT, found that the proposed underpasses would not affect the structural integrity of the bridge. To ensure the structure's stability, monitoring would be completed for the duration of the underpasses excavation and construction work.

Construction of the proposed pedestrian/bicycle underpass on the Cambridge side of the river would require demolition of the existing original staircase at the northwest approach to the bridge. A new staircase of compatible materials and updated design would be reconstructed, if feasible, in the vicinity of the original following construction of the proposed underpass.

The proposed underpasses might require boat sections to be constructed along the approaches to the underpasses. If such boat section approaches are proposed, an archaeological sensitivity assessment and possibly a survey would be required for the project.

Please note that future ABP-funded projects may also call for underpasses to be constructed through the wingwalls of the River Street Bridge (MHC# CAM.923 / B-16-006=C-01-006) and the Western Avenue Bridge (MHC# CAM.924 / B-16-010=C-01-005) to facilitate the construction of the same, proposed multi-use pathway system along the Charles River. Both of these bridges are contributing structures within the State and National Register-listed Charles River Basin Historic District.

MassDOT requests that the Massachusetts Historical Commission review the enclosed materials at their earliest convenience, and solicits any comments that the Commission wishes to make regarding the possible addition of pedestrian underpasses to the Anderson Bridge project. Written comments should be submitted to: Frank Tramontozzi, P.E., Chief Engineer, MassDOT Highway Division, 10 Park Plaza, Boston, MA 02116, Attn: Jeffrey Shrimpton. If you have any questions concerning the Section 106 process, please feel free to contact Mary Stadalnick (617-973-8286) of MassDOT Highway Division's Cultural Resources Unit.

Sincerely,

Stephen J. Roper
Historic Resources Supervisor
Environmental Services

Encl: proposed underpass feasibility plans
photographs & map

cc: Cambridge Historical Commission, Charles Sullivan (w/enclosures)
Boston Landmarks Commission, Ellen Lipsey (w/enclosures)
DCR, Jeffrey Harris (w/enclosures)
MassDOT, Steve McLaughlin (w/o enclosures)
McGinley Kalsow & Assoc., Paul McGinley (w/enclosures)

Deval L. Patrick, Governor
Timothy P. Murray, Lt. Governor
Jeffrey B. Mullan, Secretary & CEO
Luisa Paiewonsky, Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

August 26, 2010

RE: BOSTON/CAMBRIDGE—(MassDOT# 605517)
Bridge Rehabilitation Project, North Harvard Street over the Charles River
Anderson Memorial Bridge (MHC# CAM.926/MassDOT# B-16-011=C-01-007)
Addendum to the Early Environmental Coordination Letter

Ms. Ellen Lipsey, Executive Director
Boston Landmarks Commission
One City Hall Plaza, Room 805
Boston, MA 02201

Dear Ms. Lipsey:

The Massachusetts Department of Transportation (MassDOT) is proposing to rehabilitate the Anderson Memorial Bridge, which carries North Harvard Street over the Charles River between Boston and Cambridge. Constructed in 1915, the Anderson Memorial Bridge is a three-span concrete arch structure with ornamental brick facing. The bridge is listed in the State and National Registers of Historic Places as a contributing structure within the Charles River Basin Historic District. It is anticipated that this project will be supported exclusively by the state-funded Accelerated Bridge Program (ABP) and will require review, therefore, under M.G.L. Chapter 9, Sections 26-27C as amended by Chapter 254 of the Acts of 1988. This letter is an addendum to the early coordination letter sent to the Boston Landmarks Commission on February 22, 2010.

MassDOT currently is exploring the feasibility of constructing pedestrian/bicycle underpasses through the wingwalls of the Anderson Memorial Bridge along both sides of the Charles River. The proposed underpasses would enhance public safety and convenience by allowing pedestrians and cyclists to proceed under North Harvard Street along proposed new multi-use path extensions and avoid crossing the heavily congested intersections at either end of the bridge.

The proposed underpasses, which would consist of either precast or cast-in-place concrete boxes, would have a minimal vertical clearance of 8' and a width of approximately 16' to comply with

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

AASHTO standards. An engineering study, performed by F.S. & T. for MassDOT, found that the proposed underpasses would not affect the structural integrity of the bridge. To ensure the structure's stability, monitoring would be completed for the duration of the underpasses excavation and construction work.

Construction of the proposed pedestrian/bicycle underpass on the Cambridge side of the river would require demolition of the existing original staircase at the northwest approach to the bridge. A new staircase of compatible materials and updated design would be reconstructed, if feasible, in the vicinity of the original following construction of the proposed underpass.

The proposed underpasses might require boat sections to be constructed along the approaches to the underpasses. If such boat section approaches are proposed, an archaeological sensitivity assessment and possibly a survey would be required for the project.

Please note that future ABP-funded projects may also call for underpasses to be constructed through the wingwalls of the River Street Bridge (MHC# CAM.923 / B-16-006=C-01-006) and the Western Avenue Bridge (MHC# CAM.924 / B-16-010=C-01-005) to facilitate the construction of the same, proposed multi-use pathway system along the Charles River. Both of these bridges are contributing structures within the State and National Register-listed Charles River Basin Historic District.

MassDOT requests that the Boston Landmarks Commission review the enclosed materials at their earliest convenience, and solicits any comments that the Commission wishes to make regarding the possible addition of pedestrian underpasses to the Anderson Bridge project. Written comments should be submitted to: Frank Tramontozzi, P.E., Chief Engineer, MassDOT Highway Division, 10 Park Plaza, Boston, MA 02116, Attn: Jeffrey Shrimpton. If you have any questions concerning the Section 106 process, please feel free to contact Mary Stadalnick (617-973-8286) of MassDOT Highway Division's Cultural Resources Unit.

Sincerely,

Stephen J. Roper
Historic Resources Supervisor
Environmental Services

Encl: proposed underpass feasibility plans
photographs & map

cc: Massachusetts Historical Commission, Brona Simon (w/enclosures)
Cambridge Historical Commission, Charles Sullivan (w/enclosures)
DCR, Jeffrey Harris (w/enclosures)
MassDOT, Steve McLaughlin (w/o enclosures)
McGinley Kalsow & Assoc., Paul McGinley (w/enclosures)

Deval L. Patrick, Governor
Timothy P. Murray, Lt. Governor
Jeffrey B. Mullan, Secretary & CEO
Luisa Paiewonsky, Administrator

massDOT
Massachusetts Department of Transportation
Highway Division

August 26, 2010

RE: BOSTON/CAMBRIDGE—(MassDOT# 605517)
Bridge Rehabilitation Project, North Harvard Street over the Charles River
Anderson Memorial Bridge (MHC# CAM.926/MassDOT# B-16-011=C-01-007)
Addendum to the Early Environmental Coordination Letter

Mr. Charles Sullivan
Cambridge Historical Commission
831 Massachusetts Avenue, 2nd Floor
Cambridge, MA 02139

Dear Mr. Sullivan:

The Massachusetts Department of Transportation (MassDOT) is proposing to rehabilitate the Anderson Memorial Bridge, which carries North Harvard Street over the Charles River between Boston and Cambridge. Constructed in 1915, the Anderson Memorial Bridge is a three-span concrete arch structure with ornamental brick facing. The bridge is listed in the State and National Registers of Historic Places as a contributing structure within the Charles River Basin Historic District. It is anticipated that this project will be supported exclusively by the state-funded Accelerated Bridge Program (ABP) and will require review, therefore, under M.G.L. Chapter 9, Sections 26-27C as amended by Chapter 254 of the Acts of 1988. This letter is an addendum to the early coordination letter sent to the Cambridge Historical Commission on February 22, 2010.

MassDOT currently is exploring the feasibility of constructing pedestrian/bicycle underpasses through the wingwalls of the Anderson Memorial Bridge along both sides of the Charles River. The proposed underpasses would enhance public safety and convenience by allowing pedestrians and cyclists to proceed under North Harvard Street along proposed new multi-use path extensions and avoid crossing the heavily congested intersections at either end of the bridge.

The proposed underpasses, which would consist of either precast or cast-in-place concrete boxes, would have a minimal vertical clearance of 8' and a width of approximately 16' to comply with

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 617-973-7000, TDD: 617-973-7306
www.mass.gov/massdot

AASHTO standards. An engineering study, performed by F.S. & T. for MassDOT, found that the proposed underpasses would not affect the structural integrity of the bridge. To ensure the structure's stability, monitoring would be completed for the duration of the underpasses excavation and construction work.

Construction of the proposed pedestrian/bicycle underpass on the Cambridge side of the river would require demolition of the existing original staircase at the northwest approach to the bridge. A new staircase of compatible materials and updated design would be reconstructed, if feasible, in the vicinity of the original following construction of the proposed underpass.

The proposed underpasses might require boat sections to be constructed along the approaches to the underpasses. If such boat section approaches are proposed, an archaeological sensitivity assessment and possibly a survey would be required for the project.

Please note that future ABP-funded projects may also call for underpasses to be constructed through the wingwalls of the River Street Bridge (MHC# CAM.923 / B-16-006=C-01-006) and the Western Avenue Bridge (MHC# CAM.924 / B-16-010=C-01-005) to facilitate the construction of the same, proposed multi-use pathway system along the Charles River. Both of these bridges are contributing structures within the State and National Register-listed Charles River Basin Historic District.

MassDOT requests that the Cambridge Historical Commission review the enclosed materials at their earliest convenience, and solicits any comments that the Commission wishes to make regarding the possible addition of pedestrian underpasses to the Anderson Bridge project. Written comments should be submitted to: Frank Tramontozzi, P.E., Chief Engineer, MassDOT Highway Division, 10 Park Plaza, Boston, MA 02116, Attn: Jeffrey Shrimpton. If you have any questions concerning the Section 106 process, please feel free to contact Mary Stadalnick (617-973-8286) of MassDOT Highway Division's Cultural Resources Unit.

Sincerely,

Stephen J. Roper

Stephen J. Roper
Historic Resources Supervisor
Environmental Services

Encl: proposed underpass feasibility plans
photographs & map

cc: Massachusetts Historical Commission, Brona Simon (w/enclosures)
Boston Landmarks Commission, Ellen Lipsey (w/enclosures)
DCR, Jeffrey Harris (w/enclosures)
MassDOT, Steve McLaughlin (w/o enclosures)
McGinley Kalsow & Assoc., Paul McGinley (w/enclosures)

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

September 24, 2010

Frank Tramontozzi, P.E.
Chief Engineer
MassDOT Highway Division
10 Park Plaza
Boston, MA 02116

ATTN: Jeffrey Shrimpton

RE: Larz Anderson Bridge, Lower Charles River Basin, Boston & Cambridge, MA;
MHC# 37613

Dear Mr. Tramontozzi:

Thank you for your submission regarding the above referenced project, received August 27, 2010. The staff of the Massachusetts Historical Commission (MHC) has reviewed the information submitted and has the following comments.

As you are aware, the Larz Anderson Bridge is listed in the State and National Registers of Historic Places and is within the Charles River Basin Historic District. Like the Longfellow Bridge, the Larz Anderson Bridge is one of the character-defining bridges in the Charles River Basin and is a highly significant historic feature. All work performed on the bridge should conform to the Secretary of the Interior's Standards for Rehabilitation.

Construction of the proposed pedestrian/bicycle underpass would require removal of a large (at least 8'x16') through-section of the wingwalls on both sides of the river and demolition of the existing original staircase at the northwest approach to the bridge on the Cambridge side of the river. This work would have an "adverse effect" (950 CMR 71.05(a)) on this significant historic bridge.

MHC requests that MassDOT research the feasibility of a longer, deep boat section to go under the historic abutment and stairs without any demolition of historic elements of the bridge. MHC also requests that you explore the feasibility of constructing a pier supported or cantilevered deck walkway in the river that would go under the historic bridge, as close as possible to the riverbank.

It is unclear why this project would enhance pedestrian and bicyclist circulation on the Cambridge side of the River since the Weld Boathouse prohibits access along the river and must be circumvented along the existing bike path. MHC recommends MassDOT look into the feasibility of a boat section under JFK Boulevard so that pedestrians and bicyclists need not cross at the lights. The existing bike path on the Cambridge side has a sharp corner. Could the bike path be curved?

MHC notes that both the Boston and Cambridge proposals would require relocation of MWRA water mains. What are MWRA's comments and requirements?

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.state.ma.us/sec/mhc

These comments are offered to assist in compliance with M.G.L. Chapter 9, Section 26-27C, (950 CMR 71.00). Please do not hesitate to contact Brandee Loughlin of my staff if you have any questions.

Sincerely,

Brona Simon
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

xc: Steve Roper, MassDOT
Ellen Lipsey, Boston Landmarks Commission
Charles Sullivan, Cambridge Historical Commission
Marianne Connolly, MWRA

Boston
Landmarks
Commission

City of Boston
The Environment
Department

Boston City Hall/Room 805
Boston, Massachusetts 02201
617/635-3850

September 17, 2010

Frank Tramontozzi, P.E., Chief Engineer
MassDOT Highway Division
10 Park Plaza
Boston, MA 02116
Attn: Jeffrey Shrimpton

Re: Anderson Memorial Bridge (MHC# CAM.926/
MassDOT# B-16-011-C-01-007)

Dear Chief Tramontozzi:

The Boston Landmarks Commission thanks MassDOT for the preliminary submittal for the rehabilitation of the Anderson Memorial Bridge, North Harvard Street over the Charles River. The Commission (BLC) appreciates the opportunity to express some initial comments at this time under the review afforded by M.G.L, Chapter 9, Sections 26-27C as amended by Chapter 254 of the Acts of 1988.

General Comments: The BLC requests that MassDOT identify all historic resources within a ¼ mile of the Anderson Memorial Bridge that may be affected by the bridge rehabilitation. The BLC would be very interested in reviewing the Anderson Bridge rehabilitation within a comprehensive planning process for alterations to structures and pathways within MassDOT's jurisdiction and in conjunction with others who have jurisdiction including DCR, in the context of this historic landscape of the Charles River Basin. Additionally, the BLC requests review of the scope of work for the rehabilitation of the bridge itself.

Specific Comments: The shape of the underpass vaults should be revised to relate to the design and specifically the arched form of the bridge. The BLC notes the importance of the edge and surface detailing at the faces of the underpasses. The BLC strongly encourages the review of alternatives to demolition of the staircase as well as designs for replacement stairs, with the question of whether replacement stairs could be set farther away, rather than at the bridge.

The BLC looks forward to participating in the Chapter 254 review for the Anderson Bridge as rehabilitation plans for the bridge progress.

Sincerely,

Ellen J. Lipsey
Executive Director

cc: Brona Simon, MHC; Charles Sullivan, CHC; Jeffrey Harris, DCR; Paul McGinley, McGinley Kalsow & Assoc., Steve McLaughlin, MassDOT

DEVAL L. PATRICK, GOVERNOR
TIMOTHY P. MURRAY, LT. GOVERNOR
JEFFREY B. MULLAN, SECRETARY & CEO
LUISA PAIEWONSKY, ADMINISTRATOR

Moving Massachusetts Forward. massDOT Highway

November 1, 2010

Renata von Tscharner
Charles River Conservancy
4 Brattle Street
Cambridge, MA 02138

RE: Feasibility of Bicycle and Pedestrian Underpasses at Anderson Memorial, Western Avenue and River Street Bridges

Dear Ms. von Tscharner:

In response to your request for bicycle and pedestrian underpasses at the Anderson Memorial, Western Avenue and River Street Bridges, MassDOT has investigated possible options for bicycle and pedestrian accommodation improvements associated with the bridge projects, including underpasses by conducting a feasibility study for each bridge.

MassDOT appreciates the vision of providing better pedestrian and bicycle circulation along and through the Charles River Reservation pathway system by improving bicycle and pedestrian accommodations at the Charles River Basin bridges. The restoration of the Anderson Memorial, Western Avenue and River Street Bridges creates an exciting opportunity to provide access improvements. However, such projects require a balance between protection and preservation of the natural and cultural resources of the area and transportation and recreation improvements for all users. Ultimately, safety is our number one priority and we continue to work on making our roads safer for all.

The concept of constructing underpasses at both approaches to these bridges is one of several potential options for providing pedestrian/bicycle access improvements. While the connectivity benefits of the underpasses are recognized, our investigation has identified various prohibitive aspects related to their construction:

- In a letter dated September 24, 2010, the Massachusetts Historical Commission stated that installing underpasses within the wingwalls of the Anderson Memorial Bridge would have an Adverse Effect on the National Register of Historic Places (NR) listed-bridge, which contributes to the Charles River Basin NR Historic District. Both the River Street and Western Avenue Bridges also contribute to this historic district. Considerably altering the parkland and/or granite seawalls adjacent to the Charles River would also result in an Adverse Effect to the NR-listed historic district. An Adverse Effect under Section 106 or Chapter 254 would make the permitting process extremely arduous and time consuming. The proposed underpasses would slow the permitting process down and prohibit the much-needed bridge rehabilitation projects from being included as part of the Accelerated Bridge Program, which has a sunset date of June 2016.

November 1, 2010

RE: Feasibility of Bicycle and Pedestrian Underpasses at Anderson Memorial, Western Avenue and River Street Bridges

- The impacts to the historic Charles River Reservation would be extensive. Structural approaches to the underpasses would require the loss of mature trees and parkland and the overall aesthetic would be greatly impacted. Construction of the path approaches to the underpasses at River Street and Western Avenue Bridges would require a considerable amount of fill of the Charles River itself.
- Park users have expressed concern that they do not perceive underpasses to be as safe as at grade, open paths. There is a risk that park users who feel uncomfortable going through these structures would not use them.
- Additional ongoing costs would be incurred to operate and maintain the tunnel. Such costs include police patrol, lighting, periodic inspections and repairs, litter and graffiti removal, surveillance or maintenance of surveillance cameras, pumping of groundwater and ordinary sweeping/cleaning are made somewhat difficult given the low elevation and enclosed nature of the tunnel.
- The additional costs to the rehabilitation projects incurred by constructing the six underpasses would be approximately $15.5 million.

MassDOT believes that a concerted effort to provide enhanced at-grade improvements would achieve the goals of improving safety for pathway users with significantly less negative impact to the adjacent parkland, the Charles River and the bridge rehabilitation projects. The at-grade improvements will include, but not be limited to, signal upgrades, improved site distances, new crosswalks, widened approaches and queuing areas, ADA compliant ramps, on road bike lanes over and approaching the bridges and signage improvements. These at-grade improvements are preferred over the underpass alternative.

Since the pedestrian underpasses will not be part on the reconstruction of the bridges, we will endeavor to place utilities that must be relocated to areas that do not preclude constructing future pedestrian tunnels.

Thank you for your interest in these important bridge rehabilitation projects.

All correspondence regarding this matter should be directed to Frank A. Tramontozzi, P.E., Chief Engineer, Massachusetts Department of Transportation Department, Highway Division, 10 Park Plaza, Boston, MA 02116-3973; Attention M. Shoukry A. Elnahal, P.E., Deputy Chief Engineer of Bridges and Tunnels. All correspondence to MassDOT shall include the Project Manager's name, Steve McLaughlin, in the subject heading.

If you have any questions, please call Steve McLaughlin, Project Manager at 617-973-8139.

Sincerely,

M. Shoukry A. Elnahal, P.E.
Deputy Chief Engineer of Bridges & Tunnels

Att: Anderson Memorial Bridge Underpass Feasibility Study
Draft Western Avenue Bridge Underpass Feasibility Study
Draft River Street Bridge Underpass Feasibility Study

ATTACHMENT 7

Tree Removal Tables

Rehabilitation of Anderson Memorial Bridge
Tree Removals on Boston Side of Bridge

Prepared by Brown, Richardson and Rowe, Inc.
Landscape Architects and Planners
3 Post Office Square, Boston, MA 02110
November 2010

Key to Abbreviations

Size	Diameter Breast Height*
DBH-1	1-6 inches
DBH-2	7-12 inches
DBH-3	13-18 inches
DBH-4	19-24 inches
DBH-5	25-30 inches
DBH-6	31-36 inches
DBH-7	> 36 inches

*actual caliper sizes also given for trees listed on Tree Removals speadsheets

Note that in the page to follow, an indicated inventory number (No.) may refer to a single plant or to a grouping of plants. All plants within the Boston side of the project area have been identified with the same corresponding number on the project-wide inventory plan.

TREE REMOVALS ON BOSTON SIDE OF BRIDGE
November 2010

Tree No.	Genus	Species	Quantity	DBH Code	DBH Caliper in Inches	Condition	Reason	Location
1	*Acer*	*platanoides*	1 (2 stems)	4, 4	12.5, 15	VOLUNTEER (at bridge foundation)	Location, Invasive	100 foot buffer
2	*Acer*	*platanoides*	1	3	15	VOLUNTEER (at bridge foundation)	Location, Invasive	100 foot buffer
3	*Malus*	*species*	1 (3 stems)	2, 2, 2	8, 12, 12	FAIR	Location	100 foot buffer
4	*Ulmus*	*species*	1	3	12	VOLUNTEER	Location, partially dead	100 foot buffer
5	*Malus*	*species*	1 (8 stems)	1	1.5 to 4.5	FAIR	Location	100 foot buffer
5A	*Platanus*	*species*	1	1	2.5	VOLUNTEER (in armor stone erosion control)	Location	100 foot buffer
6	*Acer*	*platanoides 'Crimson King'*	1	3	16	FAIR	Master Plan - Restore Historic Plan	100 foot buffer
7	*Malus*	*species*	1 (3 stems)	1, 1, 1	2, 2, 2	FAIR	Location, Master Plan - Restore Historic Plan	100 foot buffer
7A	*Malus*	*species*	1 (3 stems)	1, 1, 1	2, 2, 2	VOLUNTEER (in armor stone erosion control)	Location, partially dead	100 foot buffer
7B	*Rhamnus*	*cathartica*	1	1	2	VOLUNTEER (in armor stone erosion control)	Location, Invasive	100 foot buffer
8	*Acer*	*platanoides 'Crimson King'*	1	3	16	FAIR	Master Plan - Restore Historic Plan	100 foot buffer
9	*Acer*	*platanoides 'Crimson King'*	1	3	17	FAIR	Master Plan - Restore Historic Plan	100 foot buffer
26	*Acer*	*platanoides 'Crimson King'*	1	2	16	FAIR	Master Plan - Restore Historic Plan	100 foot buffer
28	*Ulmus*	*species*	1	3	13	VOLUNTEER	Location	100 foot buffer
29	*Ulmus*	*species*	1 (2 stems)	2, 3	12, 18	VOLUNTEER (at bridge foundation)	Location	100 foot buffer
30	*Ulmus*	*species*	1 (2 stems)	3, 4	18, 21	VOLUNTEER (at bridge foundation)	Location	100 foot buffer
	Summary of Tree Removals on Boston side of bridge:							
	16 Total Tree Removals (none of these trees are completely dead)							
	16 Tree Removals Within 100 ft. Wetland Buffer Line							
	0 Tree Removals Beyond 100 ft. Wetland Buffer Line							
	8 Trees to be Removed that are definitely 14 inches or greater -							
	2 Trees to be Removed that are approaching 14-inch caliper breast height at this date and may possibly be 14-inch caliper at Contract start-up							
Notes:	**Additional trees may need to be removed pending determination of final area requirements for construction staging area(s).**							

Red trees indicate trees at bridge foundations

Rehabilitation of Anderson Memorial Bridge
Tree Removals on Cambridge Side of Bridge

Prepared by Brown, Richardson and Rowe, Inc.
Landscape Architects and Planners
3 Post Office Square, Boston, MA 02110
November 2010

Key to Abbreviations:

Size Code	Diameter Breast Height*
DBH-1	1-6 inches
DBH-2	7-12 inches
DBH-3	13-18 inches
DBH-4	19-24 inches
DBH-5	25-30 inches
DBH-6	31-36 inches
DBH-7	> 36 inches

*actual caliper sizes also given for trees listed on Tree Removals speadsheets

Note that in the page to follow, an indicated inventory number (No.) may refer to a single plant or to a grouping of plants. All plants within the Cambridge side of the project area have been identified with the same corresponding number on the project-wide inventory plan.

TREE REMOVALS ON CAMBRIDGE SIDE OF BRIDGE
November 2010

Tree No.	Genus	Species	Quantity	DBH Code	DBH Caliper in Inches	Condition	Reason	Location
31	*Ulmus*	*species*	1	2	10	VOLUNTEER (at bridge foundation)	Location	100 foot buffer
32	*Crataegus*	*phenopyrum*	15 (1-4 stems) in group	1	1.5 to 5	FAIR to GOOD	Public Safety	100 foot buffer
33	*Crataegus*	*phenopyrum*	7 (3-6 stems) in group	1	2 to 5	FAIR to GOOD	Public Safety	
34	*Prunus*	*cerasifera*	4 (2-4 stems) in group	1	1.5 to 5	FAIR to GOOD	Restore Historic Planting; Constr. Staging; Public Safety	
37	*Betula*	*papyrifera*	1 (4 stems)	1, 1, 2, 2	7, 7, 5, 5	POOR (bark stripped, some stems hacked, dead)	Condition	100 foot buffer
38	*Prunus*	*serrata 'Kwanzan'*	1 (2 stems)	2, 2	10, 9	FAIR	Condition, Restore Historic Planting	100 foot buffer
39	*Acer*	*platanoides*	1	4	24	GOOD	Invasive	100 foot buffer
40	*Acer*	*campestre*	1	2	9.5	GOOD	Location: Construction Staging	100 foot buffer
41A	*Prunus*	*serrata 'Kwanzan'*	6 in group	1	4 to 9	FAIR	Restore Historic Planting; Constr. Staging; Public Safety	100 foot buffer
41B	*Prunus*	*serrata 'Kwanzan'*	5 in group	1	6 to 8	FAIR	Restore Historic Planting; Constr. Staging; Public Safety	
46	*Acer*	*saccharum*	1	4	27	POOR	Condition	
58	*Platanus*	*x acerifolia*	1	2	10	POOR	Condition	
64	*Ulmus*	*species*	1	2	12	VOLUNTEER (at boathouse foundation)	Location	100 foot buffer
65	*Morus*	*alba*	1 (4 stems)	1, 2, 2, 2	6, 9, 10, 12	VOLUNTEER	Invasive	100 foot buffer
66	*Fraxinus*	*americana*	1 (2 stems)	2, 4	8, 20	VOLUNTEER (in stone riprap)	Location	100 foot buffer
67	*Acer*	*saccharinum*	1 (2 stems)	1, 1	3, 5.5	VOLUNTEER (in stone riprap)	Location	100 foot buffer
68	*Alnus*	*species*	1	2	8	VOLUNTEER (in stone riprap)	Location, Invasive	100 foot buffer
69	*Ulmus*	*species*	4 in group	2	7.5, 10, 11, 13	VOLUNTEER (at bridge foundation)	Location	100 foot buffer
70	*Rhamnus*	*cathartica*	6 (1 -3 stems) in group	1	1.5 to 4.5	VOLUNTEER (at bridge foundation)	Location, Invasive	100 foot buffer
71	*Morus*	*alba*	1 (4 stems)	1, 2, 2, 3	6, 7, 7.5, 16	VOLUNTEER (at bridge foundation)	Location, Invasive	100 foot buffer

Summary:

60 Total Tree Removals on Cambridge side of bridge (none of these trees are completely dead)

42 Tree Removals Within 100 ft. Wetland Buffer Line

18 Tree Removals Beyond 100 ft. Wetland Buffer Line

4 Trees to be Removed that are definitely 14 inches or greater

3 Trees that are approaching 14-inch caliper size that may reach this size at time of construction

Red type indicates trees at bridge foundations

Notes: Additional trees may need to be removed pending determination of final area requirements for construction staging area(s).

ATTACHMENT 8

Early Coordination Correspondence

CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

PRINCIPALS AND ASSOCIATE:

Yee Cho, PE, LSP
Kathleen Campbell, PE, LSP, LEED AP
Jack Goodhall, PE

June 24, 2010

The Honorable Thomas Menino
Mayor of Boston
Boston City Hall
1 City Hall Square, Suite 500
Boston, MA 02201

RE: Rehabilitation of the Anderson Memorial Bridge
Bridge No. B-16-011=C01-007
North Harvard Street over Charles River, Boston – Cambridge
MassDOT Project No. 605517

Dear Mayor Menino:

The Massachusetts Department of Transportation (MassDOT) is currently in the preliminary design phase for the Rehabilitation of the Anderson Memorial Bridge in Boston and Cambridge, Massachusetts (See attached locus map). Fay, Spofford, and Thorndike, LLC (FST) is providing the design services and project management, with CDW Consultants, Inc. (CDW) as part of the FST Project Team. This Project is part of MassDOT's Accelerated Bridge Program and consists of design, permitting and construction phase services for the proposed superstructure improvements described below.

The project involves structural repairs to the existing three-span concrete arch that carries North Harvard Street over the Charles River. Work includes repairs and rehabilitation of the brick masonry components throughout the structure, parapets, spandrel walls over the piers and abutments, wing-walls, concrete arches and deck, and stairways. The proposed roadway cross section will carry a total of 3 lanes of traffic (two northbound and one southbound), as well as 1 bicycle lane and 1 cement concrete sidewalk in each direction. The final width of the bridge will match the original dimension of 64 feet out to out. The project also includes lighting and utility upgrades on the bridge superstructure and landscape improvements adjacent to the bridge. Project construction will be staged to minimize impacts and maintain pedestrian and vehicular traffic. As such, MassDOT is anticipating that project activities will require a Notice of Intent filing with the Boston Conservation Commission under the Massachusetts Wetlands Protection Act.

At this time, MassDOT would like to be made aware of any specific concerns or issues that you may have regarding this project, so that we can address any potential issues prior to proceeding to future design stages. The Department of Public Works, Conservation Commission, Redevelopment Authority, and the Landmarks Commission have also been notified about this project. Thank you in advance for your time and effort. If you have any questions about the project please contact me at (508) 875-2657 x19.

Sincerely yours,

CDW CONSULTANTS, INC.

Denise Bartone
Project Manager

Attachment

cc: Mr. Paul Harrington, Fay, Spofford & Thorndike, LLC
Ms. Tracy Osimboni, MassDOT Project Manager

CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

PRINCIPALS AND ASSOCIATE:

Yee Cho, PE, LSP
Kathleen Campbell, PE, LSP, LEED AP
Jack Goodhall, PE

June 24, 2010

Mr. Chris Busch, Executive Secretary
City of Boston Conservation Commission
Boston City Hall
1 City Hall Square, Room 805
Boston, MA 02201

RE: Rehabilitation of the Anderson Memorial Bridge
Bridge No. B-16-011=C01-007
North Harvard Street over Charles River, Boston – Cambridge
MassDOT Project No. 605517

Dear Mr. Busch:

The Massachusetts Department of Transportation (MassDOT) is currently in the preliminary design phase for the Rehabilitation of the Anderson Memorial Bridge in Boston and Cambridge, Massachusetts (See attached locus map). Fay, Spofford, and Thorndike, LLC (FST) is providing the design services and project management, with CDW Consultants, Inc. (CDW) as part of the FST Project Team. This Project is part of MassDOT's Accelerated Bridge Program and consists of design, permitting and construction phase services for the proposed superstructure improvements described below.

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At this time, MassDOT would like to be made aware of any specific concerns or issues that the Boston Conservation Commission may have regarding this project, so that we can address any potential issues prior to proceeding to future design stages. Thank you in advance for your time and effort. If you have any questions about the project please contact me at (508) 875-2657 x19.

Very truly yours,

CDW CONSULTANTS, INC.

Denise Bartone
Project Manager

Attachment

cc: Mr. Paul Harrington, Fay, Spofford & Thorndike, LLC
Ms. Tracy Osimboni, MassDOT Project Manager

CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

PRINCIPALS AND ASSOCIATE:

Yee Cho, PE, LSP
Kathleen Campbell, PE, LSP, LEED AP
Jack Goodhall, PE

June 24, 2010

Ms. Joanne Massaro, Chief of Public Works and Transportation
City of Boston Department of Public Works
Boston City Hall
1 City Hall Square, Room 714
Boston, MA 02201

RE: Rehabilitation of the Anderson Memorial Bridge
Bridge No. B-16-011=C01-007
North Harvard Street over Charles River, Boston – Cambridge
MassDOT Project No. 605517

Dear Ms. Massaro:

The Massachusetts Department of Transportation (MassDOT) is currently in the preliminary design phase for the Rehabilitation of the Anderson Memorial Bridge in Boston and Cambridge, Massachusetts (See attached locus map). Fay, Spofford, and Thorndike, LLC (FST) is providing the design services and project management, with CDW Consultants, Inc. (CDW) as part of the FST Project Team. This Project is part of MassDOT's Accelerated Bridge Program and consists of design, permitting and construction phase services for the proposed superstructure improvements described below.

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At this time, MassDOT would like to be made aware of any specific concerns or issues that the Boston Department of Public Works may have regarding this project, so that we can address any potential issues prior to proceeding to future design stages. Thank you in advance for your time and effort. If you have any questions about the project please contact me at (508) 875-2657 x19.

Very truly yours,

CDW CONSULTANTS, INC.

Denise Bartone
Project Manager

Attachment

cc: Mr. Paul Harrington, Fay, Spofford & Thorndike, LLC
Ms. Tracy Osimboni, MassDOT Project Manager

CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

PRINCIPALS AND ASSOCIATE:

Yee Cho, PE, LSP
Kathleen Campbell, PE, LSP, LEED AP
Jack Goodhall, PE

June 24, 2010

Mr. Kairos Shen, Director of Planning
City of Boston Redevelopment Authority
Boston City Hall
1 City Hall Square, 9th Floor
Boston, MA 02201

RE: Rehabilitation of the Anderson Memorial Bridge
Bridge No. B-16-011=C01-007
North Harvard Street over Charles River, Boston – Cambridge
MassDOT Project No. 605517

Dear Mr. Shen:

The Massachusetts Department of Transportation (MassDOT) is currently in the preliminary design phase for the Rehabilitation of the Anderson Memorial Bridge in Boston and Cambridge, Massachusetts (See attached locus map). Fay, Spofford, and Thorndike, LLC (FST) is providing the design services and project management, with CDW Consultants, Inc. (CDW) as part of the FST Project Team. This Project is part of MassDOT's Accelerated Bridge Program and consists of design, permitting and construction phase services for the proposed superstructure improvements described below.

The project involves structural repairs to the existing three-span concrete arch that carries North Harvard Street over the Charles River. Work includes repairs and rehabilitation of the brick masonry components throughout the structure, parapets, spandrel walls over the piers and abutments, wing-walls, concrete arches and deck, and stairways. The proposed roadway cross section will carry a total of 3 lanes of traffic (two northbound and one southbound), as well as 1 bicycle lane and 1 cement concrete sidewalk in each direction. The final width of the bridge will match the original dimension of 64 feet out to out. The project also includes lighting and utility upgrades on the bridge superstructure and landscape improvements adjacent to the bridge. Project construction will be staged to minimize impacts and maintain pedestrian and vehicular traffic. As such, MassDOT is anticipating that project activities will require a Notice of Intent filing with the Boston Conservation Commission under the Massachusetts Wetlands Protection Act.

At this time, MassDOT would like to be made aware of any specific concerns or issues that the Boston Redevelopment Authority may have regarding this project, so that we can address any potential issues prior to proceeding to future design stages. Thank you in advance for your time and effort. If you have any questions about the project please contact me at (508) 875-2657 x19.

Very truly yours,

CDW CONSULTANTS, INC.

Denise Bartone
Project Manager

Attachment

cc: Mr. Paul Harrington, Fay, Spofford & Thorndike, LLC
Ms. Tracy Osimboni, MassDOT Project Manager

CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

PRINCIPALS AND ASSOCIATE:

Yee Cho, PE, LSP
Kathleen Campbell, PE, LSP, LEED AP
Jack Goodhall, PE

June 24, 2010

The Honorable David Maher
Mayor of Cambridge
Cambridge City Hall
795 Massachusetts Ave
Cambridge, Ma 02139

RE: Rehabilitation of the Anderson Memorial Bridge
Bridge No. B-16-011=C01-007
North Harvard Street over Charles River, Boston – Cambridge
MassDOT Project No. 605517

Dear Mayor Maher:

The Massachusetts Department of Transportation (MassDOT) is currently in the preliminary design phase for the Rehabilitation of the Anderson Memorial Bridge in Boston and Cambridge, Massachusetts (See attached locus map). Fay, Spofford, and Thorndike, LLC (FST) is providing the design services and project management, with CDW Consultants, Inc. (CDW) as part of the FST Project Team. This Project is part of MassDOT's Accelerated Bridge Program and consists of design, permitting and construction phase services for the proposed superstructure improvements described below.

The project involves structural repairs to the existing three-span concrete arch that carries North Harvard Street over the Charles River. Work includes repairs and rehabilitation of the brick masonry components throughout the structure, parapets, spandrel walls over the piers and abutments, wing-walls, concrete arches and deck, and stairways. The proposed roadway cross section will carry a total of 3 lanes of traffic (two northbound and one southbound), as well as 1 bicycle lane and 1 cement concrete sidewalk in each direction. The final width of the bridge will match the original dimension of 64 feet out to out. The project also includes lighting and utility upgrades on the bridge superstructure and landscape improvements adjacent to the bridge. Project construction will be staged to minimize impacts and maintain pedestrian and vehicular traffic. As such, MassDOT is anticipating that project activities will require a Notice of Intent filing with the Cambridge Conservation Commission under the Massachusetts Wetlands Protection Act.

At this time, MassDOT would like to be made aware of any specific concerns or issues that you may have regarding this project, so that we can address any potential issues prior to proceeding to future design stages. The Department of Public Works, Conservation Commission, Environmental and Transportation Planning Department, and the Historic Commission have also been notified about this project. Thank you in advance for your time and effort. If you have any questions about the project please contact me at (508) 875-2657 x19.

Sincerely yours,

CDW CONSULTANTS, INC.

Denise Bartone
Project Manager

Attachment

cc: Mr. Paul Harrington, Fay, Spofford & Thorndike, LLC
Ms. Tracy Osimboni, MassDOT Project Manager

CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

PRINCIPALS AND ASSOCIATE:

Yee Cho, PE, LSP
Kathleen Campbell, PE, LSP, LEED AP
Jack Goodhall, PE

June 24, 2010

Ms. Jennifer Wright, Director
City of Cambridge Conservation Commission
344 Broadway
Cambridge, MA 02139

RE: Rehabilitation of the Anderson Memorial Bridge
Bridge No. B-16-011=C01-007
North Harvard Street over Charles River, Boston – Cambridge
MassDOT Project No. 605517

Dear Ms. Wright:

The Massachusetts Department of Transportation (MassDOT) is currently in the preliminary design phase for the Rehabilitation of the Anderson Memorial Bridge in Boston and Cambridge, Massachusetts (See attached locus map). Fay, Spofford, and Thorndike, LLC (FST) is providing the design services and project management, with CDW Consultants, Inc. (CDW) as part of the FST Project Team. This Project is part of MassDOT's Accelerated Bridge Program and consists of design, permitting and construction phase services for the proposed superstructure improvements described below.

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At this time, MassDOT would like to be made aware of any specific concerns or issues that the Cambridge Conservation Commission may have regarding this project, so that we can address any potential issues prior to proceeding to future design stages. Thank you in advance for your time and effort. If you have any questions about the project please contact me at (508) 875-2657 x19.

Very truly yours,

CDW CONSULTANTS, INC.

Denise Bartone
Project Manager

Attachment

cc: Mr. Paul Harrington, Fay, Spofford & Thorndike, LLC
Ms. Tracy Osimboni, MassDOT Project Manager

CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

PRINCIPALS AND ASSOCIATE:

Yee Cho, PE, LSP
Kathleen Campbell, PE, LSP, LEED AP
Jack Goodhall, PE

June 24, 2010

Ms. Lisa Peterson, Commissioner
City of Cambridge Department of Public Works
147 Hampshire Street
Cambridge, MA 02139

RE: Rehabilitation of the Anderson Memorial Bridge
Bridge No. B-16-011=C01-007
North Harvard Street over Charles River, Boston – Cambridge
MassDOT Project No. 605517

Dear Ms. Peterson:

The Massachusetts Department of Transportation (MassDOT) is currently in the preliminary design phase for the Rehabilitation of the Anderson Memorial Bridge in Boston and Cambridge, Massachusetts (See attached locus map). Fay, Spofford, and Thorndike, LLC (FST) is providing the design services and project management, with CDW Consultants, Inc. (CDW) as part of the FST Project Team. This Project is part of MassDOT's Accelerated Bridge Program and consists of design, permitting and construction phase services for the proposed superstructure improvements described below.

The project involves structural repairs to the existing three-span concrete arch that carries North Harvard Street over the Charles River. Work includes repairs and rehabilitation of the brick masonry components throughout the structure, parapets, spandrel walls over the piers and abutments, wing-walls, concrete arches and deck, and stairways. The proposed roadway cross section will carry a total of 3 lanes of traffic (two northbound and one southbound), as well as 1 bicycle lane and 1 cement concrete sidewalk in each direction. The final width of the bridge will match the original dimension of 64 feet out to out. The project also includes lighting and utility upgrades on the bridge superstructure and landscape improvements adjacent to the bridge. Project construction will be staged to minimize impacts and maintain pedestrian and vehicular traffic. As such, MassDOT is anticipating that project activities will require a Notice of Intent filing with the Cambridge Conservation Commission under the Massachusetts Wetlands Protection Act.

At this time, MassDOT would like to be made aware of any specific concerns or issues that the Cambridge Department of Public Works may have regarding this project, so that we can address any potential issues prior to proceeding to future design stages. Thank you in advance for your time and effort. If you have any questions about the project please contact me at (508) 875-2657 x19.

Very truly yours,

CDW CONSULTANTS, INC.

Denise Bartone
Project Manager

Attachment

cc: Mr. Paul Harrington, Fay, Spofford & Thorndike, LLC
Ms. Tracy Osimboni, MassDOT Project Manager

CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

PRINCIPALS AND ASSOCIATE:

Yee Cho, PE, LSP
Kathleen Campbell, PE, LSP, LEED AP
Jack Goodhall, PE

June 24, 2010

Ms. Susanne Rasmussen, Director
City of Cambridge Environmental and Transportation Planning
344 Broadway
Cambridge, MA 02139

RE: Rehabilitation of the Anderson Memorial Bridge
Bridge No. B-16-011=C01-007
North Harvard Street over Charles River, Boston – Cambridge
MassDOT Project No. 605517

Dear Ms. Rasmussen:

The Massachusetts Department of Transportation (MassDOT) is currently in the preliminary design phase for the Rehabilitation of the Anderson Memorial Bridge in Boston and Cambridge, Massachusetts (See attached locus map). Fay, Spofford, and Thorndike, LLC (FST) is providing the design services and project management, with CDW Consultants, Inc. (CDW) as part of the FST Project Team. This Project is part of MassDOT's Accelerated Bridge Program and consists of design, permitting and construction phase services for the proposed superstructure improvements described below.

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At this time, MassDOT would like to be made aware of any specific concerns or issues that the Cambridge Department of Environmental and Transportation Planning may have regarding this project, so that we can address any potential issues prior to proceeding to future design stages. Thank you in advance for your time and effort. If you have any questions about the project please contact me at (508) 875-2657 x19.

Very truly yours,

CDW CONSULTANTS, INC.

Denise Bartone
Project Manager

Attachment

cc: Mr. Paul Harrington, Fay, Spofford & Thorndike, LLC
Ms. Tracy Osimboni, MassDOT Project Manager

DEVAL L. PATRICK, GOVERNOR
TIMOTHY P. MURRAY, LT. GOVERNOR
JEFFREY B. MULLAN, SECRETARY & CEO
LUISA PAIEWONSKY, ADMINISTRATOR

Moving Massachusetts Forward. massDOT Highway

02/22/2010

RE: **Rehabilitation of the Anderson Memorial Bridge (B-16-011), North Harvard Street over the Charles River, Boston / Cambridge**
(MassDOT Highway Division, Accelerated Bridge Program Project Number **605517**)
Section 106 Review

Ms. Brona Simon
State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02116

Dear Ms. Brona Simon:

The Massachusetts Department of Transportation, Accelerated Bridge Program proposes to **rehabilitate the Anderson Memorial Bridge which carries North Harvard Street over the Charles River in Boston /Cambridge.** It is anticipated that this project will be supported in part with federal funds and will require review, therefore, under Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). The enclosed project information is provided for the **Massachusetts Historical Commission's** review in compliance with the regulations governing Section 106.

Built in 1915, the existing bridge is a three-span, spandrel wall earth filled concrete arch bridge with an overall length of 440 feet including the approaches, two 10-foot lanes each way and 10-foot side walks on each side of the bridge. The rehabilitation of this structure would include repair/replacement of drainage system, concrete spandrel walls and parapets, repair/reinforcement of concrete arch and miscellaneous repairs to other elements of the bridge structure, repair/replacement of the brick walls and bridge lightning system.

MassDOT Highway Division requests that Massachusetts Historical Commission review the enclosed materials at their earliest convenience, and solicits any comments that the commission wishes to make regarding this project. Written comments should be submitted to: Frank Tramontozzi, P.E., Chief Engineer, MassDOT Highway Division, 10 Park Plaza, Boston, MA 02116, Attn: Jeffrey Shrimpton.

If you have any questions concerning the enclosed project information, please feel free to contact Tracy Osimboni (617 686 4439) of MassDOT Highway Division's Accelerated Bridge Program Project Management Section. If you have any questions concerning the Section 106 process, please feel free to contact Jeffrey Shrimpton (617 973-7497) of MassDOT Highway Division's Cultural Resources Unit.

Sincerely,

Thomas P. Donald, P.E.
Director of Program Development
Accelerated Bridge Program
Massachusetts Department of Transportation

atts: Scope of work
Locus map

xcs: B. Simon, SHPO, MHC, with atts.
J. Shrimpton, MassDOT Highway Division, with atts.

DEVAL L. PATRICK, GOVERNOR
TIMOTHY P. MURRAY, LT. GOVERNOR
JEFFREY B. MULLAN, SECRETARY & CEO
LUISA PAIEWONSKY, ADMINISTRATOR

Moving Massachusetts Forward. massDOT Highway

02/22/2010

RE: **Rehabilitation of the Anderson Memorial Bridge (B-16-011), North Harvard Street over the Charles River, Boston / Cambridge**
(MassDOT Highway Division, Accelerated Bridge Program Project Number **605517**)
Section 106 Review

Charles Sullivan, Executive Director
Cambridge Historical Commission
831 Massachusetts Avenue
Cambridge, MA 02201

Dear Mr. Sullivan:

The Massachusetts Department of Transportation, Accelerated Bridge Program proposes to **rehabilitate the Anderson Memorial Bridge which carries North Harvard Street over the Charles River in Boston /Cambridge.** It is anticipated that this project will be supported in part with federal funds and will require review, therefore, under Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). The enclosed project information is provided for the **Cambridge Historical Commission's** review in compliance with the regulations governing Section 106.

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If you have any questions concerning the enclosed project information, please feel free to contact Tracy Osimboni (617 686 4439) of MassDOT Highway Division's Accelerated Bridge Program Project Management Section. If you have any questions concerning the Section 106 process, please feel free to contact Jeffrey Shrimpton (617 973-7497) of MassDOT Highway Division's Cultural Resources Unit.

Sincerely,

Thomas P. Donald, P.E.
Director of Program Development
Accelerated Bridge Program
Massachusetts Department of Transportation

atts: Scope of work
Locus map

xcs: B. Simon, SHPO, MHC, with atts.
J. Shrimpton, MassDOT Highway Division, with atts.

DEVAL L. PATRICK, GOVERNOR
TIMOTHY P. MURRAY, LT. GOVERNOR
JEFFREY B. MULLAN, SECRETARY & CEO
LUISA PAIEWONSKY, ADMINISTRATOR

Moving Massachusetts Forward. massDOT Highway

02/22/2010

RE: **Rehabilitation of the Anderson Memorial Bridge (B-16-011), North Harvard Street over the Charles River, Boston / Cambridge**
(MassDOT Highway Division, Accelerated Bridge Program Project Number **605517**)
Section 106 Review

Ms. Ellen Lipsey, Executive Director
Boston Landmarks Commission
Environmental Department
Boston City Hall/Room 805
Boston, MA 02201

Dear Ms. Lipsey:

The Massachusetts Department of Transportation, Accelerated Bridge Program proposes to **rehabilitate the Anderson Memorial Bridge which carries North Harvard Street over the Charles River in Boston /Cambridge.** It is anticipated that this project will be supported in part with federal funds and will require review, therefore, under Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). The enclosed project information is provided for the **Boston Landmarks Commission's** review in compliance with the regulations governing Section 106.

Built in 1915, the existing bridge is a three-span, spandrel wall earth filled concrete arch bridge with an overall length of 440 feet including the approaches, two 10-foot lanes each way and 10-foot side walks on each side of the bridge. The rehabilitation of this structure would include repair/replacement of drainage system, concrete spandrel walls and parapets, repair/reinforcement of concrete arch and miscellaneous repairs to other elements of the bridge structure, repair/replacement of the brick walls and bridge lightning system.

MassDOT Highway Division requests that Boston Landmarks Commission review the enclosed materials at their earliest convenience, and solicits any comments that the commission wishes to make regarding this project. Written comments should be submitted to: Frank Tramontozzi, P.E., Chief Engineer, MassDOT Highway Division, 10 Park Plaza, Boston, MA 02116, Attn: Jeffrey Shrimpton.

If you have any questions concerning the enclosed project information, please feel free to contact Tracy Osimboni (617 686 4439) of MassDOT Highway Division's Accelerated Bridge Program Project Management Section. If you have any questions concerning the Section 106 process, please feel free to contact Jeffrey Shrimpton (617 973-7497) of MassDOT Highway Division's Cultural Resources Unit.

Sincerely,

Thomas P. Donald, P.E.
Director of Program Development
Accelerated Bridge Program
Massachusetts Department of Transportation

atts: Scope of work
Locus map

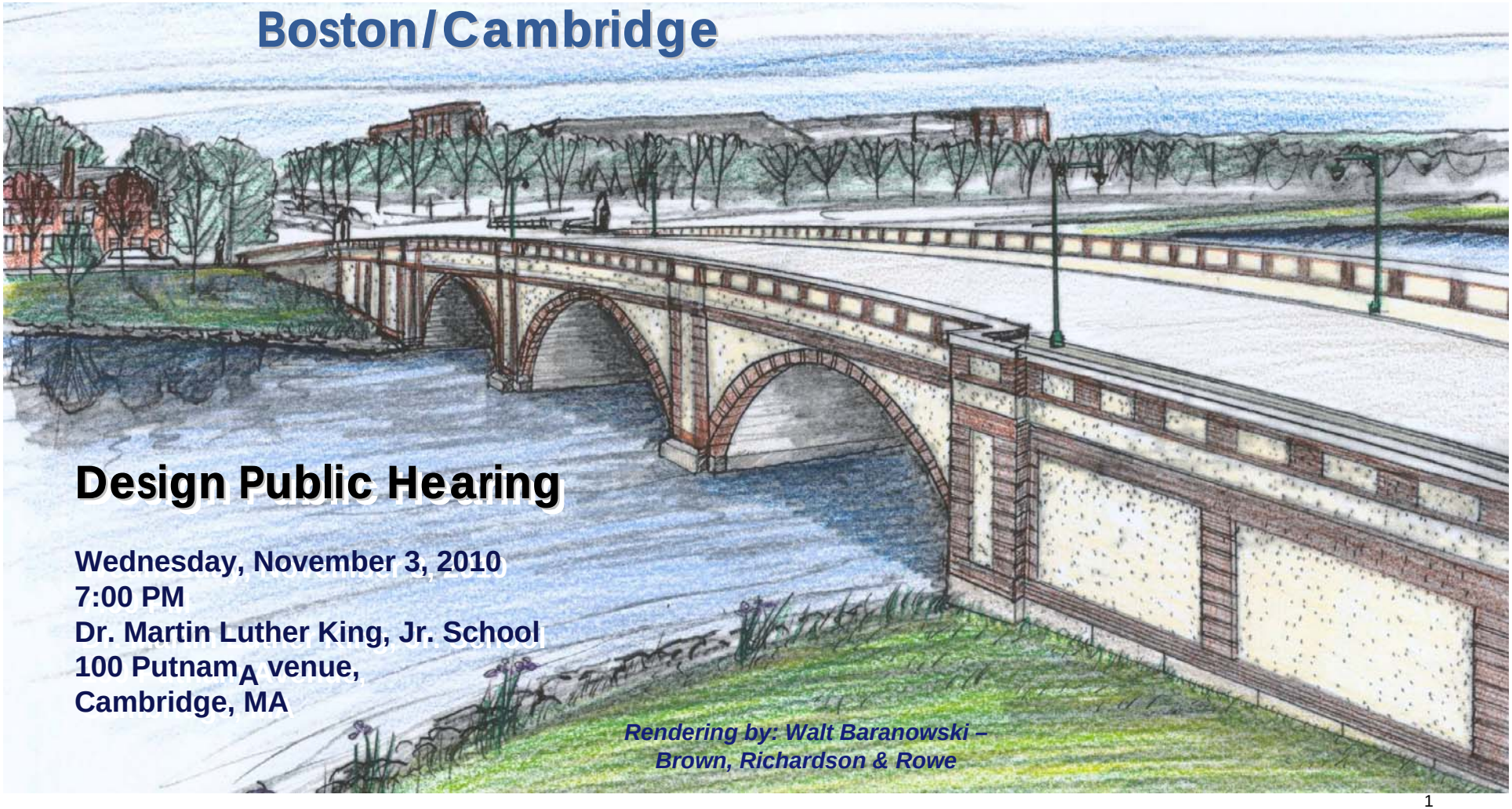
xcs: B. Simon, SHPO, MHC, with atts.
J. Shrimpton, MassDOT Highway Division, with atts.

ATTACHMENT 9

Design Public Meeting Presentation

Anderson Memorial Bridge Rehabilitation Project

Boston/Cambridge



Design Public Hearing

Wednesday, November 3, 2010
7:00 PM
Dr. Martin Luther King, Jr. School
100 Putnam Avenue,
Cambridge, MA

Rendering by: Walt Baranowski – Brown, Richardson & Rowe

Agenda

- Accelerated Bridge Program Overview
- Charles River Basin Projects
- Anderson Memorial Bridge Rehabilitation
- Discussion

Program Overview

- **Authorization:**
  - Chapter 233 of the Acts of 2008
  - Program must be complete by 2016

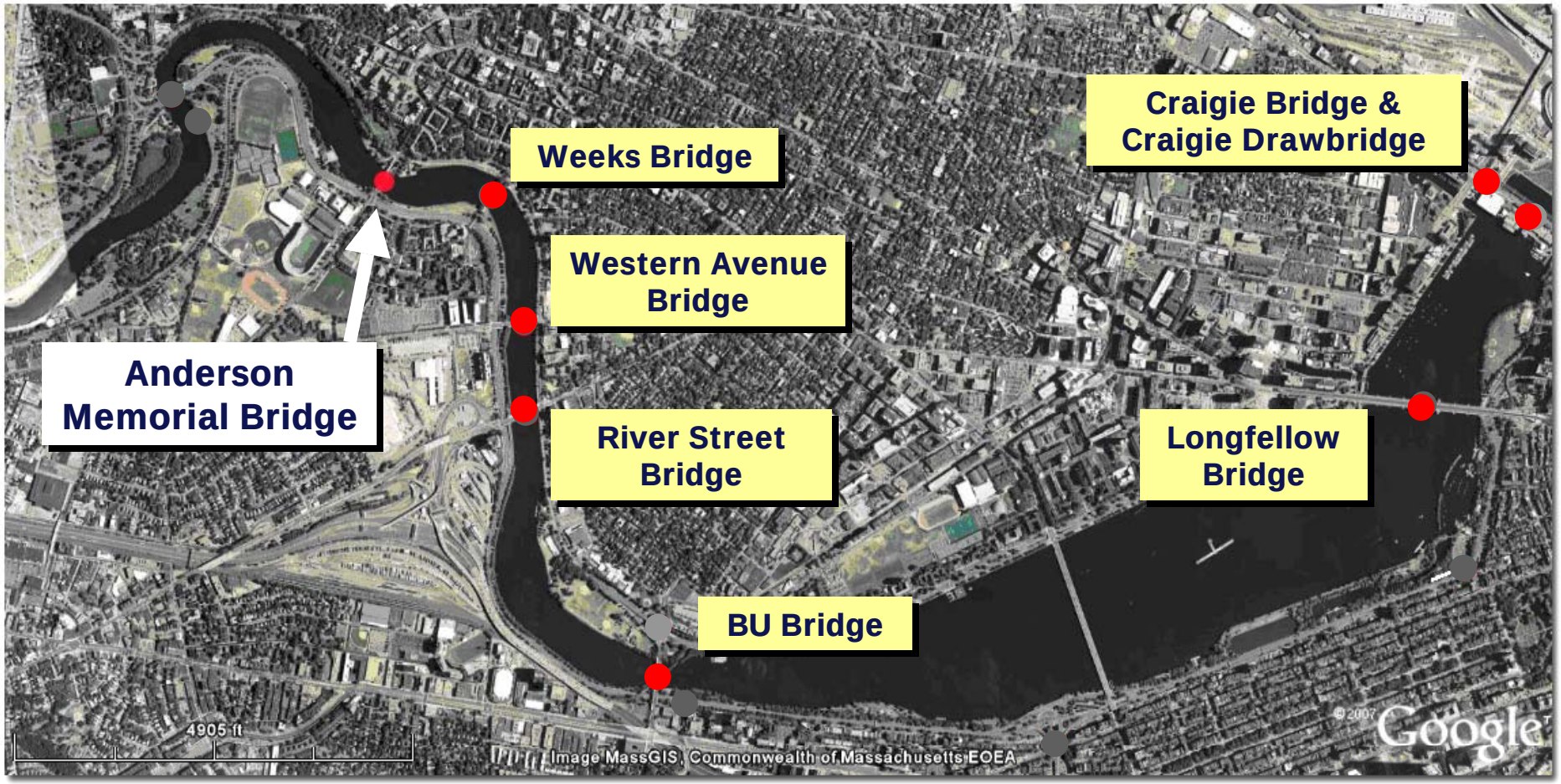
- **Program Goals:**
  - Improve the Condition of the Commonwealth's Bridges
  - Stimulate Economic Development and Job Creation
  - Save Money by Completing Projects Sooner
  - Complete Projects Efficiently and Innovatively
  - Provide Access and Opportunity for All
  - Manage with Transparency and Accountability

Program Overview- 8 years only

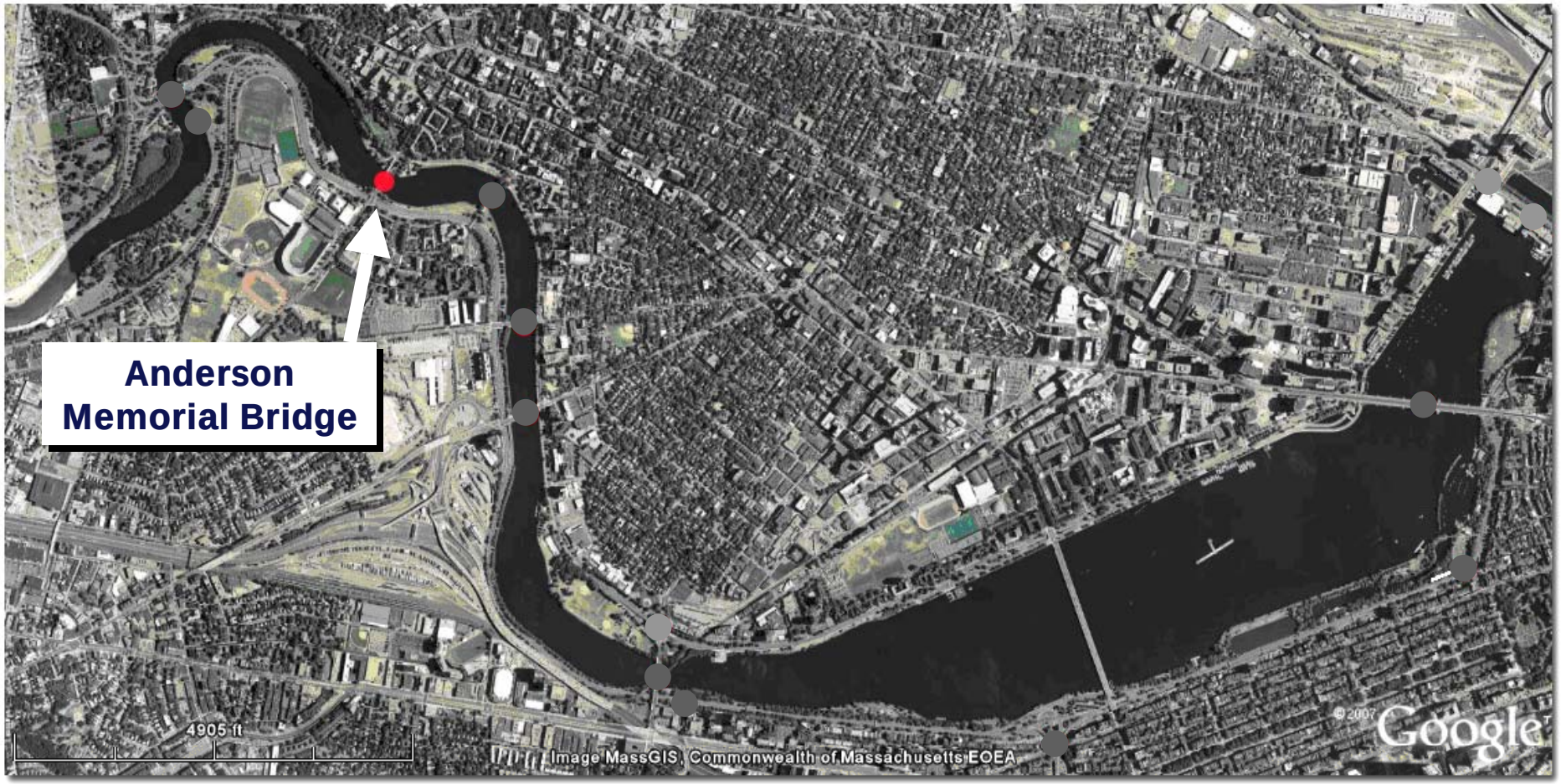
- **Size and Scope**
  - Former MassHighway: $2.078 billion
    - rehabilitation or replacement of 189 bridges
    - preservation of 305 bridges
  - Former DCR: $906 million
    - rehabilitation or replacement of 29 bridges
    - preservation of 50 bridges

MassDOT Total Program: $2,984,000,000

Anderson Memorial Bridge



Anderson Memorial Bridge



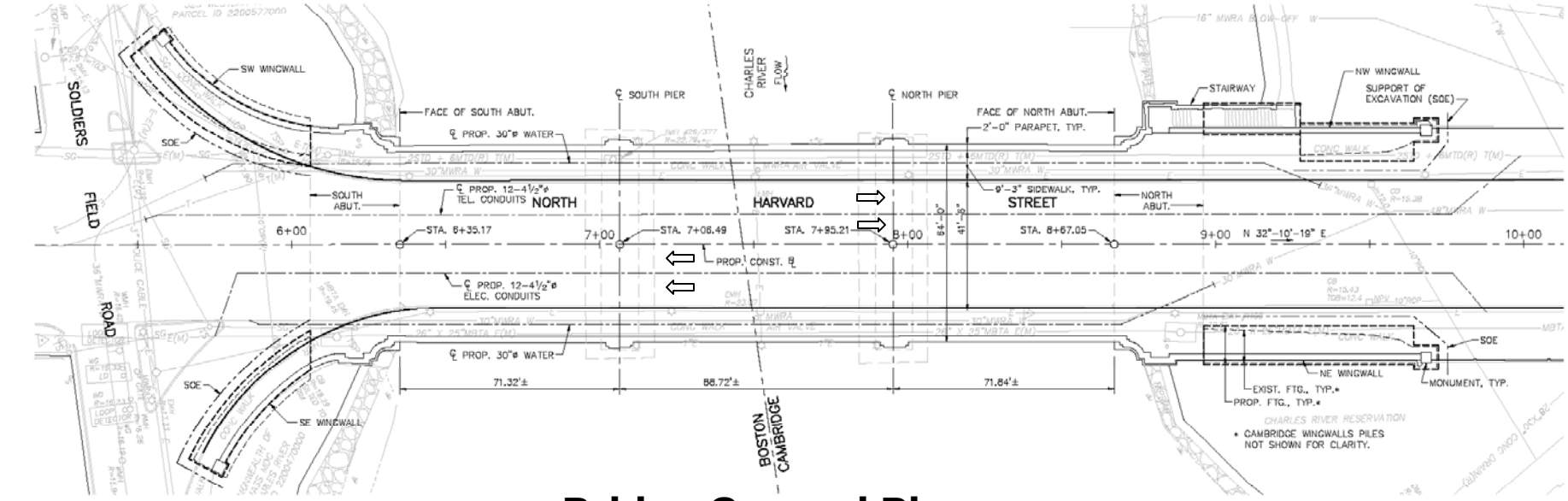
Key Meetings

- **Public Informational Meeting**
  - December 15, 2009
  - July 22, 2010
- **Stakeholder Meetings**
  - December 22, 2009
  - June 18, 2010
  - July 19, 2010
  - September 30, 2010
  - October 26, 2010
  - October 27, 2010

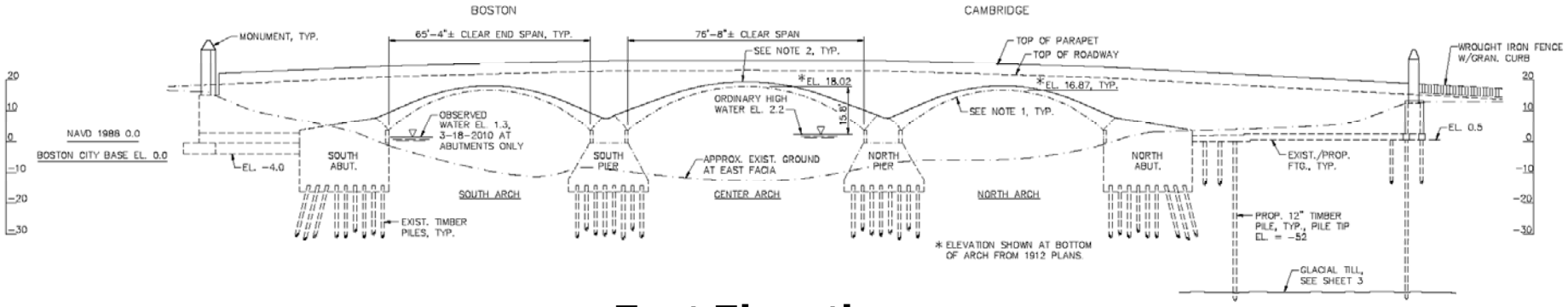

Anderson Memorial Bridge
Key Plan
Anderson Memorial Bridge
JFK Street
Harvard Stadium
North Harvard St.
Weeks Pedestrian Bridge

Existing Bridge

- Three-span earth filled concrete arch bridge
- 440 feet long (including approaches)
- Two 10-foot lanes each way
- 10-foot sidewalks on each side of the bridge
- Built in 1913
- Historic Bridge
  - Listed on State and National Registers of Historic Places
  - Integral component of historic Charles River Basin

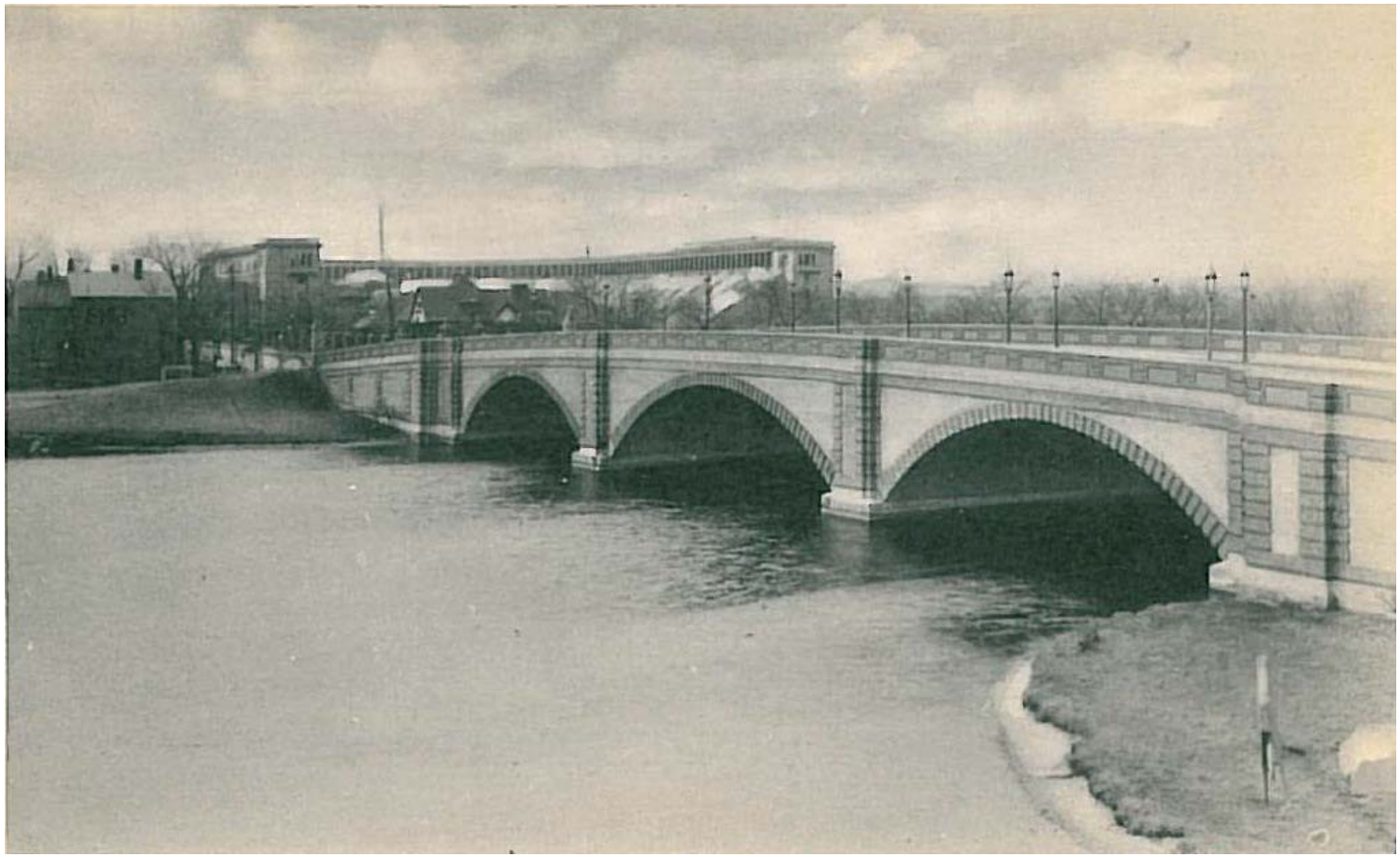


Bridge General Plan



East Elevation

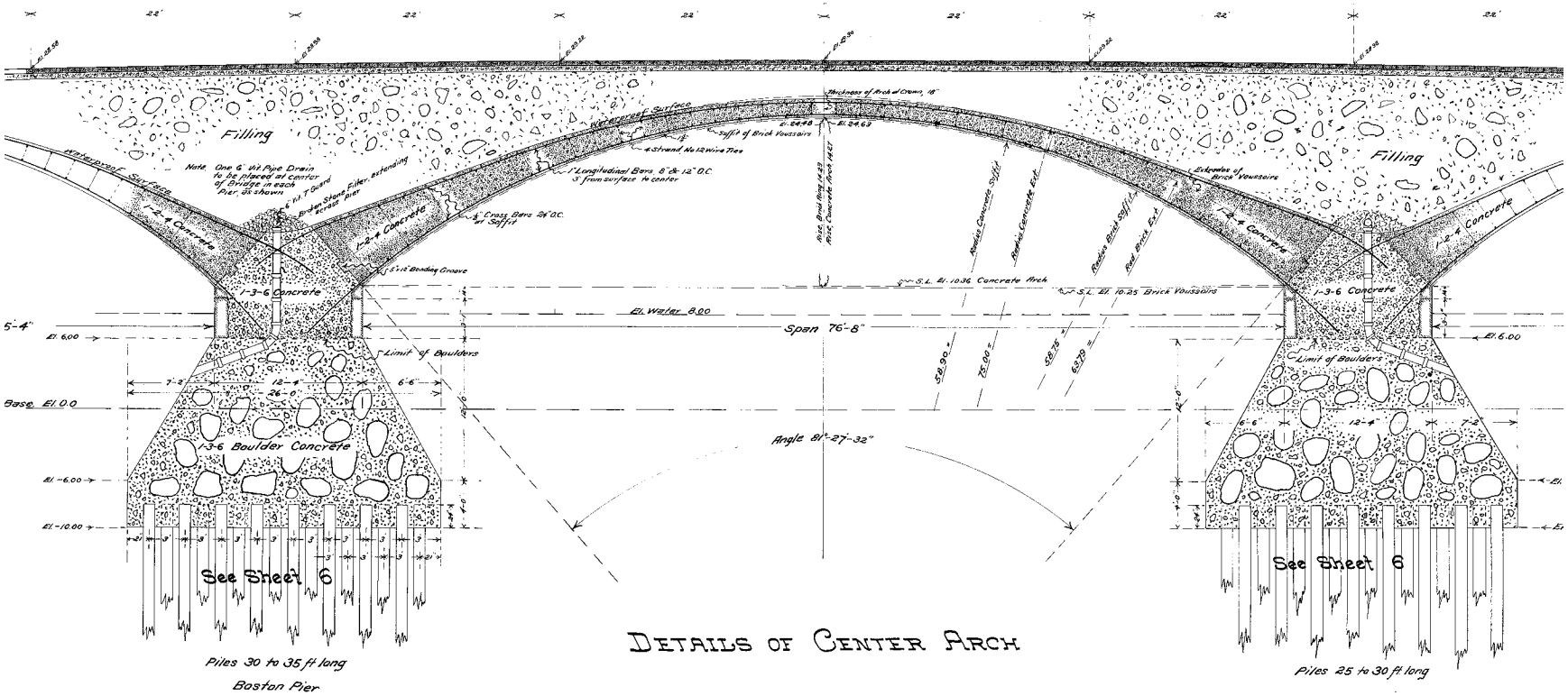
Anderson Memorial Bridge



ca. 1915 Historic Postcard

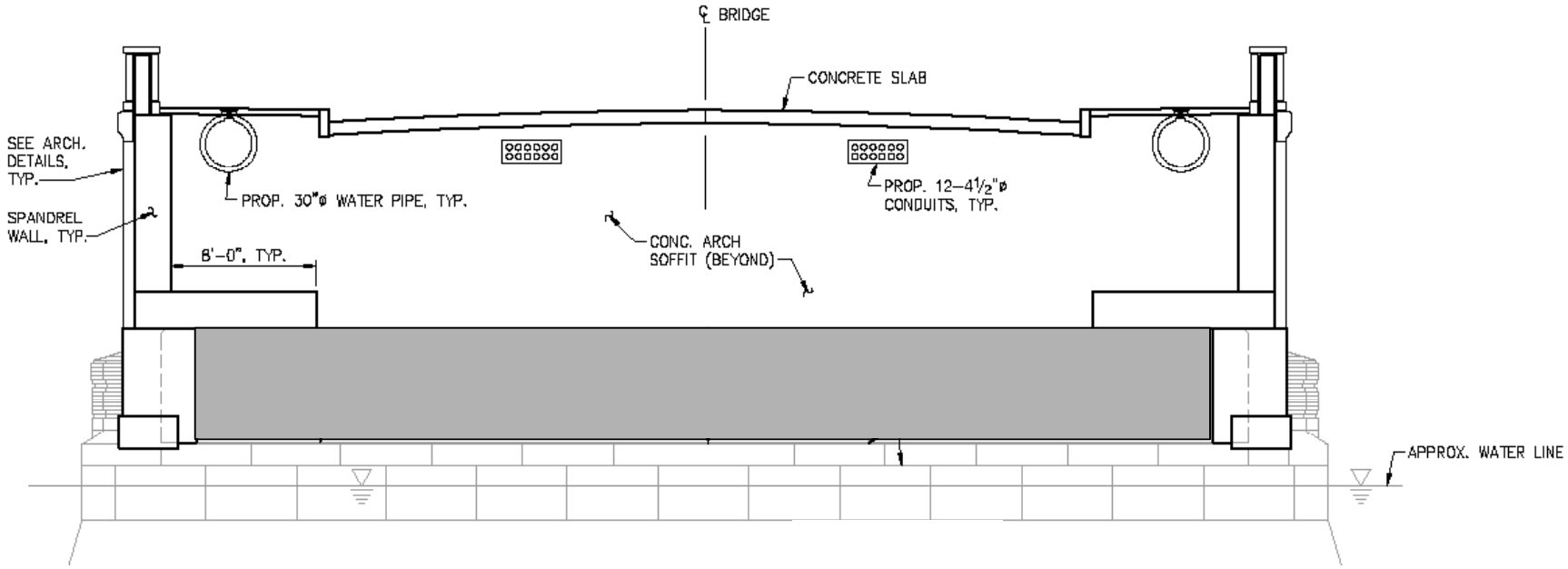
Existing Bridge

Longitudinal Section at Center Arch



DETAILS OF CENTER ARCH

Proposed Cross-Section at Pier/Abutment

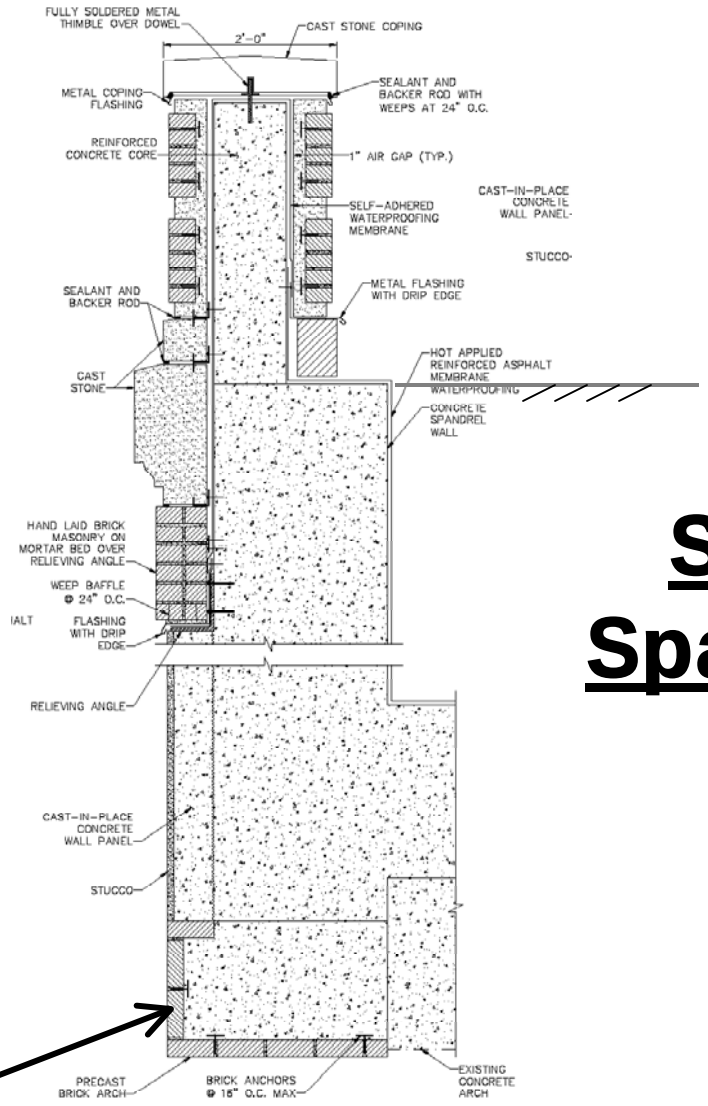


Parapet

Spandrel Wall

Concrete Arch

Brick Arch Ring

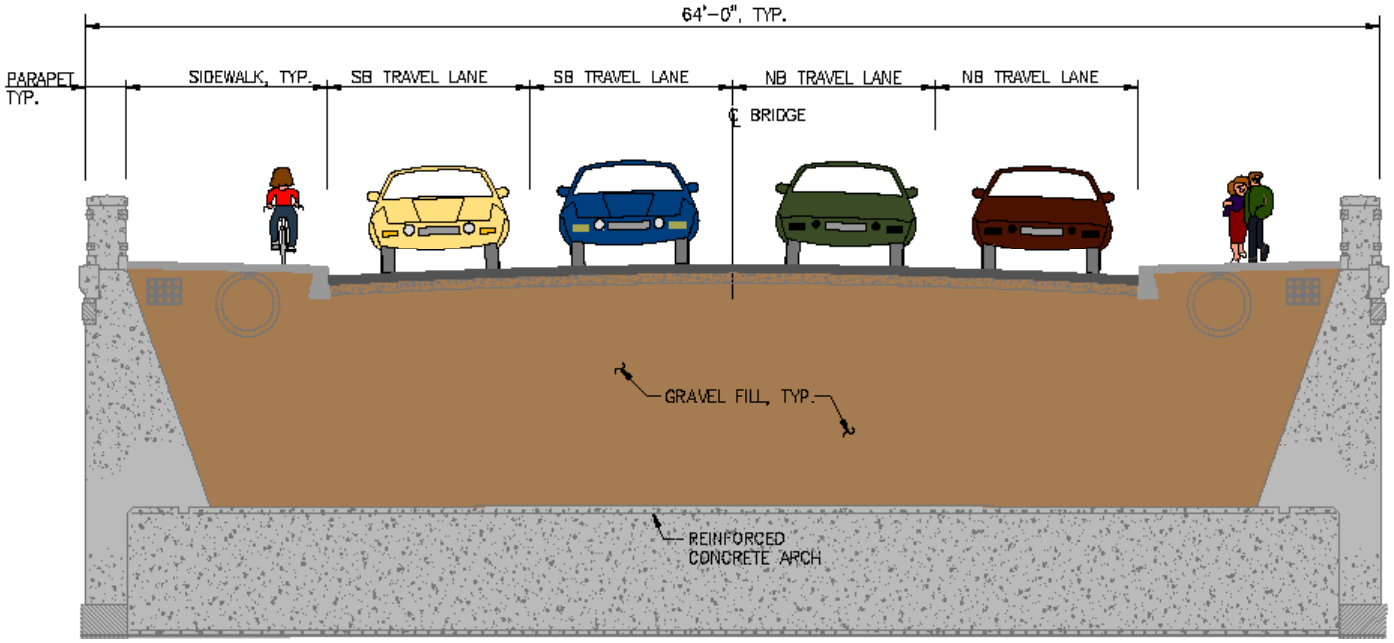


Section at Spandrel Wall

Staged Construction

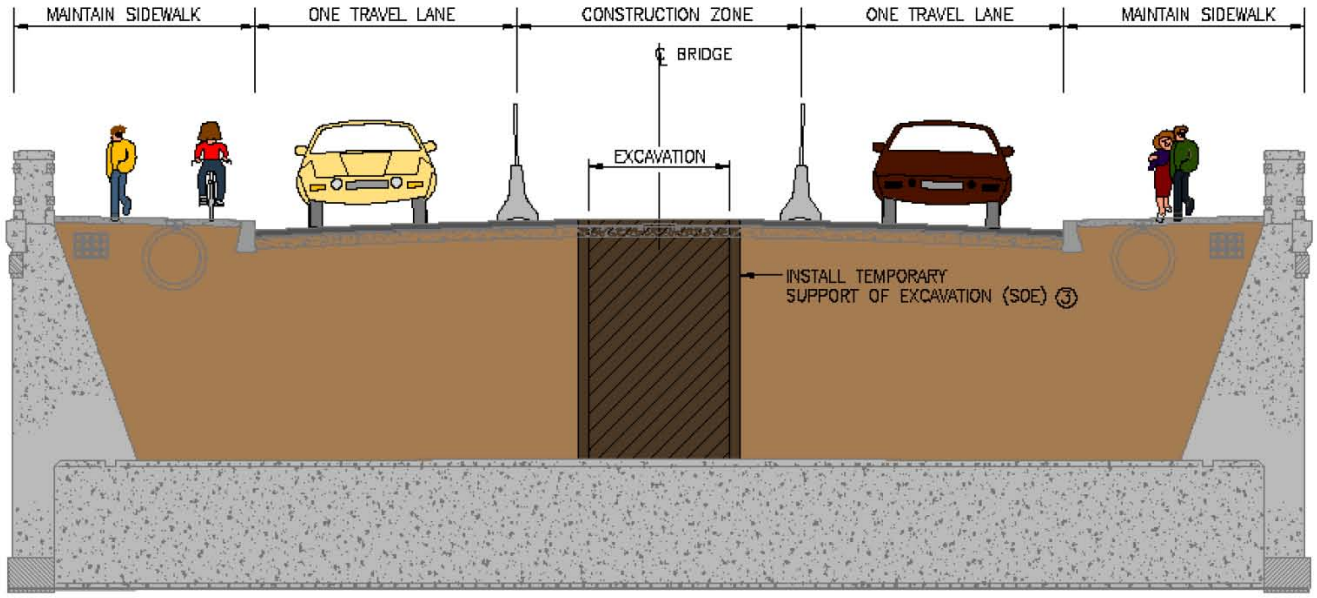
Existing Roadway Section

(Construction Duration = 24 Months)



EXISTING SECTION
(LOOKING NORTH TO CAMBRIDGE)

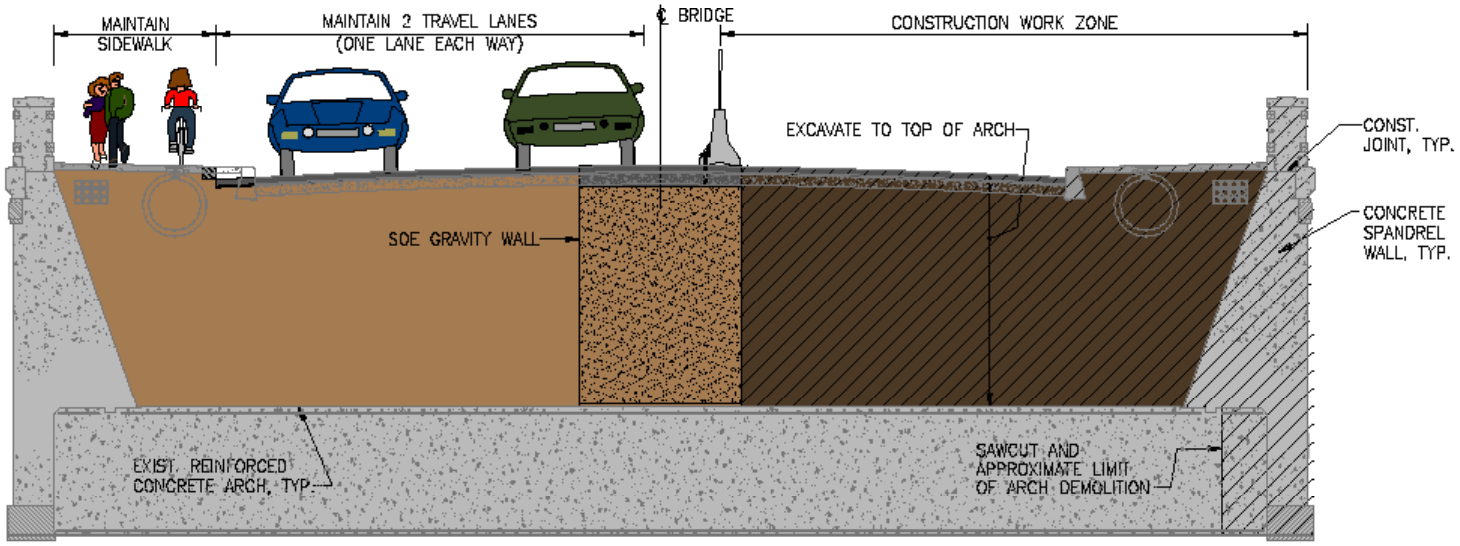
Stage 1
Rehab Middle Section of Bridge



CONSTRUCTION STAGE 1
(LOOKING NORTH TO CAMBRIDGE)

Stage 2

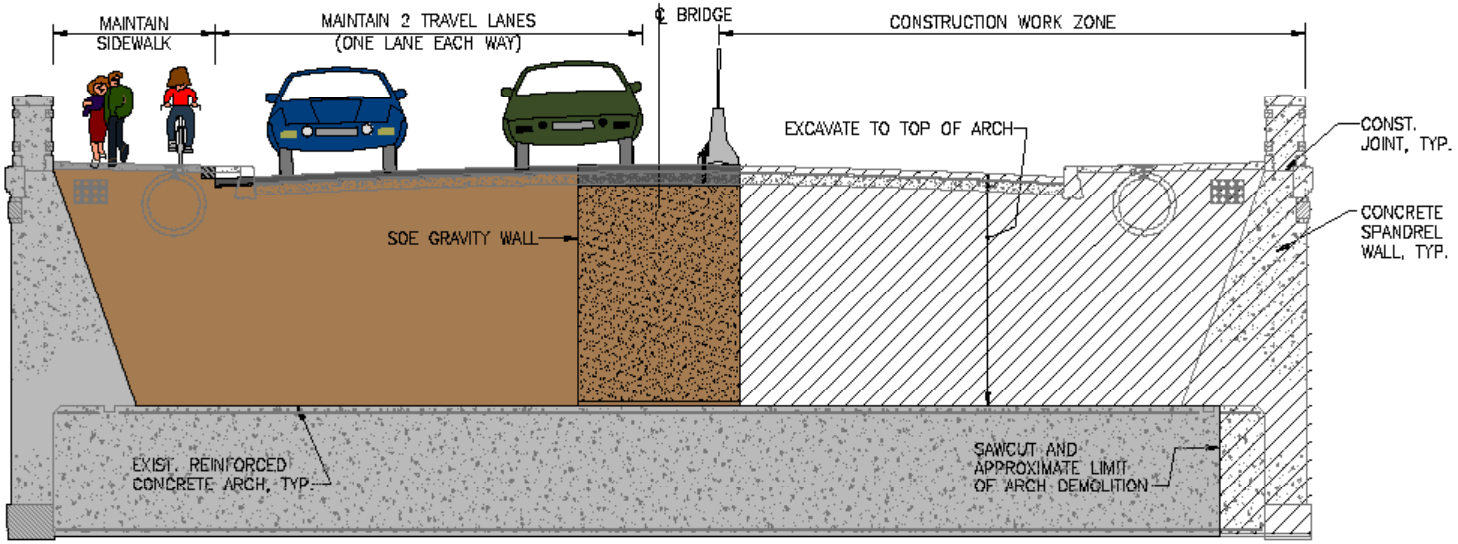
Rehab East Side (Downstream) of Bridge



CONSTRUCTION STAGE 2
(LOOKING NORTH TO CAMBRIDGE)

Stage 2

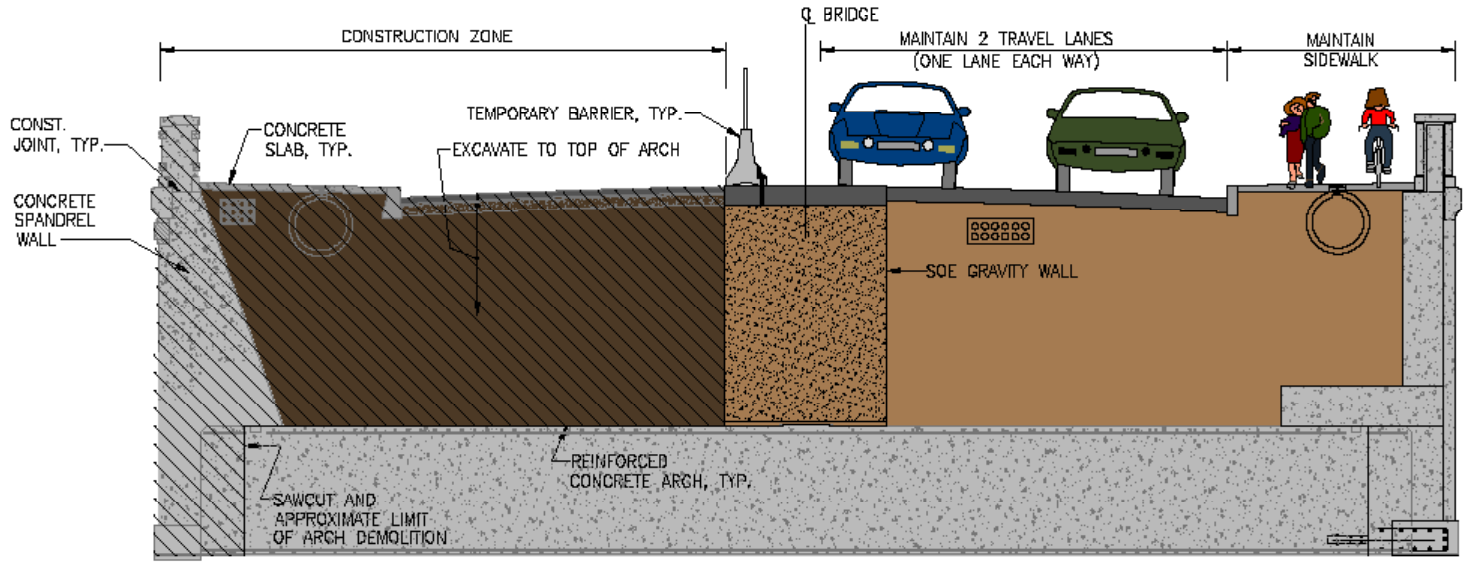
Rehab East Side (Downstream) of Bridge



CONSTRUCTION STAGE 2
(LOOKING NORTH TO CAMBRIDGE)

Stage 3

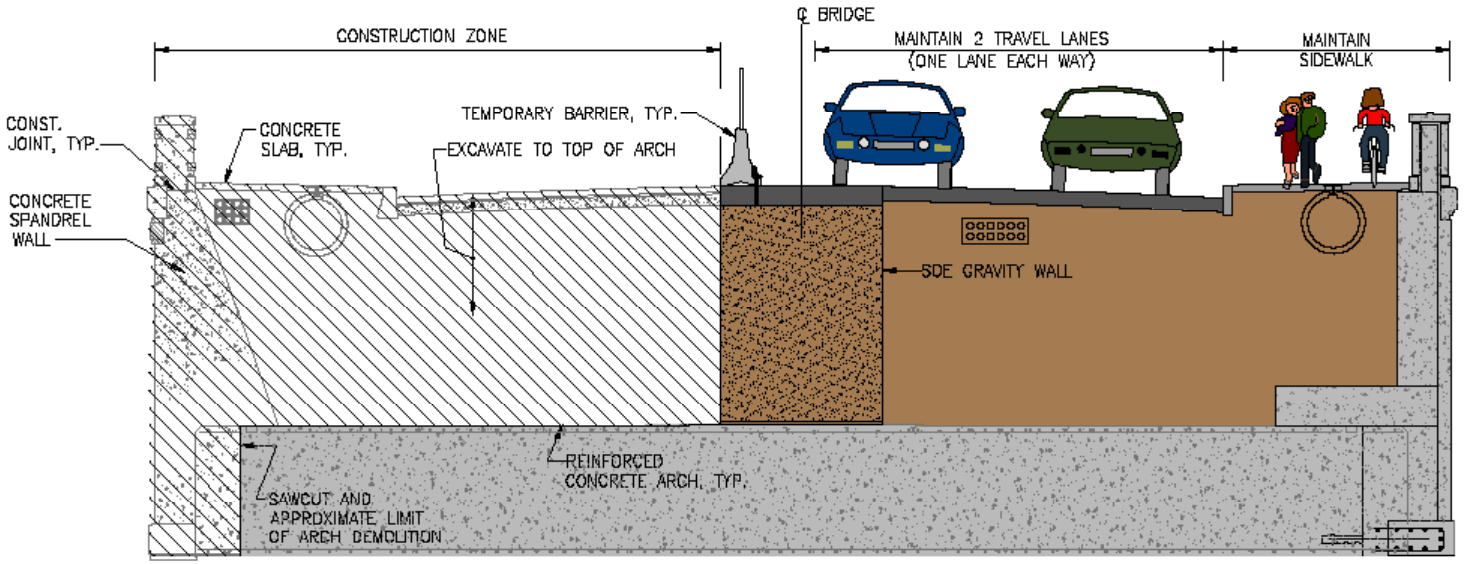
Rehab West Side (Upstream) of Bridge



CONSTRUCTION STAGE 3
(LOOKING NORTH TO CAMBRIDGE)

Stage 3

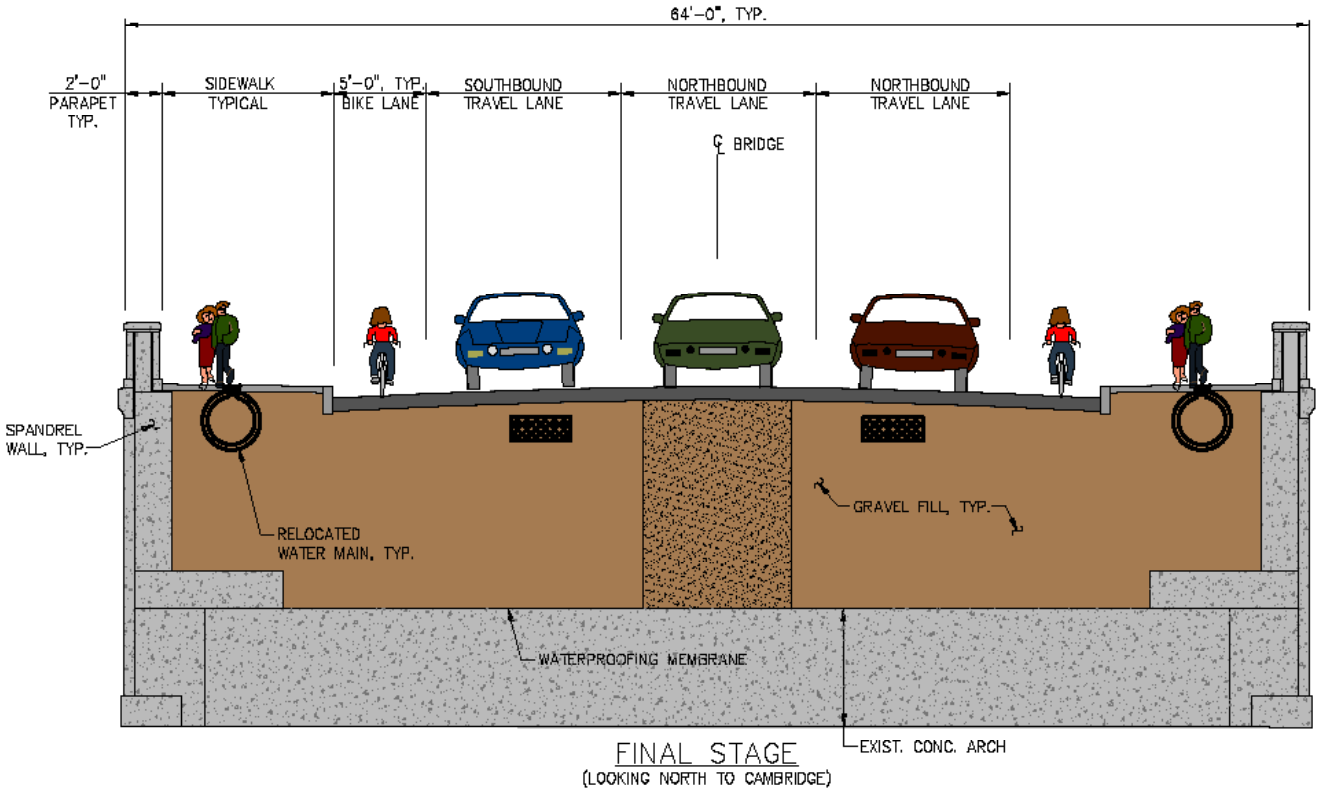
Rehab West Side (Upstream) of Bridge



CONSTRUCTION STAGE 3
(LOOKING NORTH TO CAMBRIDGE)

Stage 4

Complete Road Construction

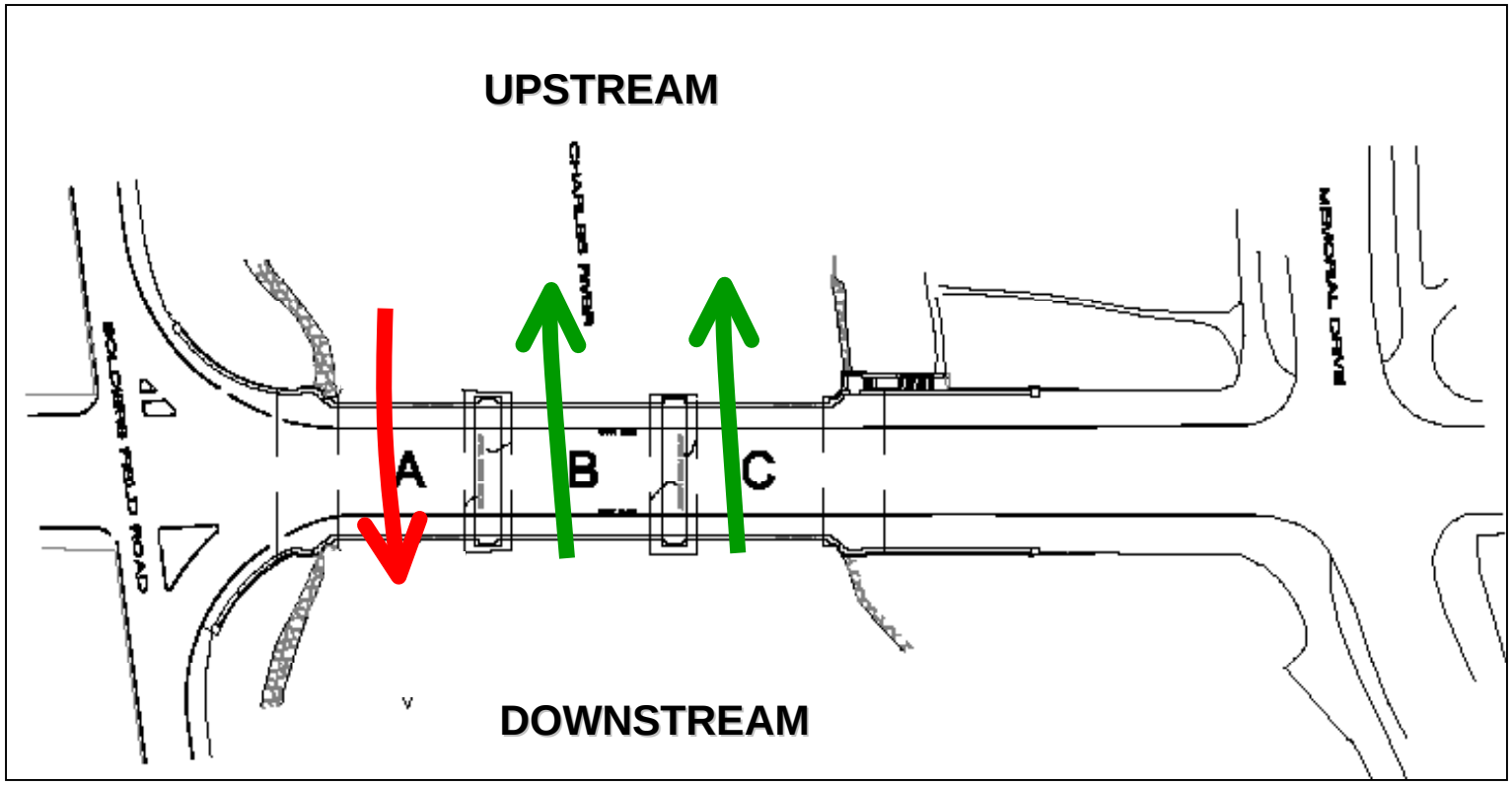


Construction Staging in the River

- **Construction staging for the work in the River is required to rehabilitate the arches**
- **Key staging elements include:**
  - Limit work such that only one arch barrel at a time is closed for concrete repairs
  - Minimize the duration of any temporary vertical clearance reductions
  - Sequence the construction to minimize the impact
  - Safety measures for boaters will include advance notification to users and warning buoys

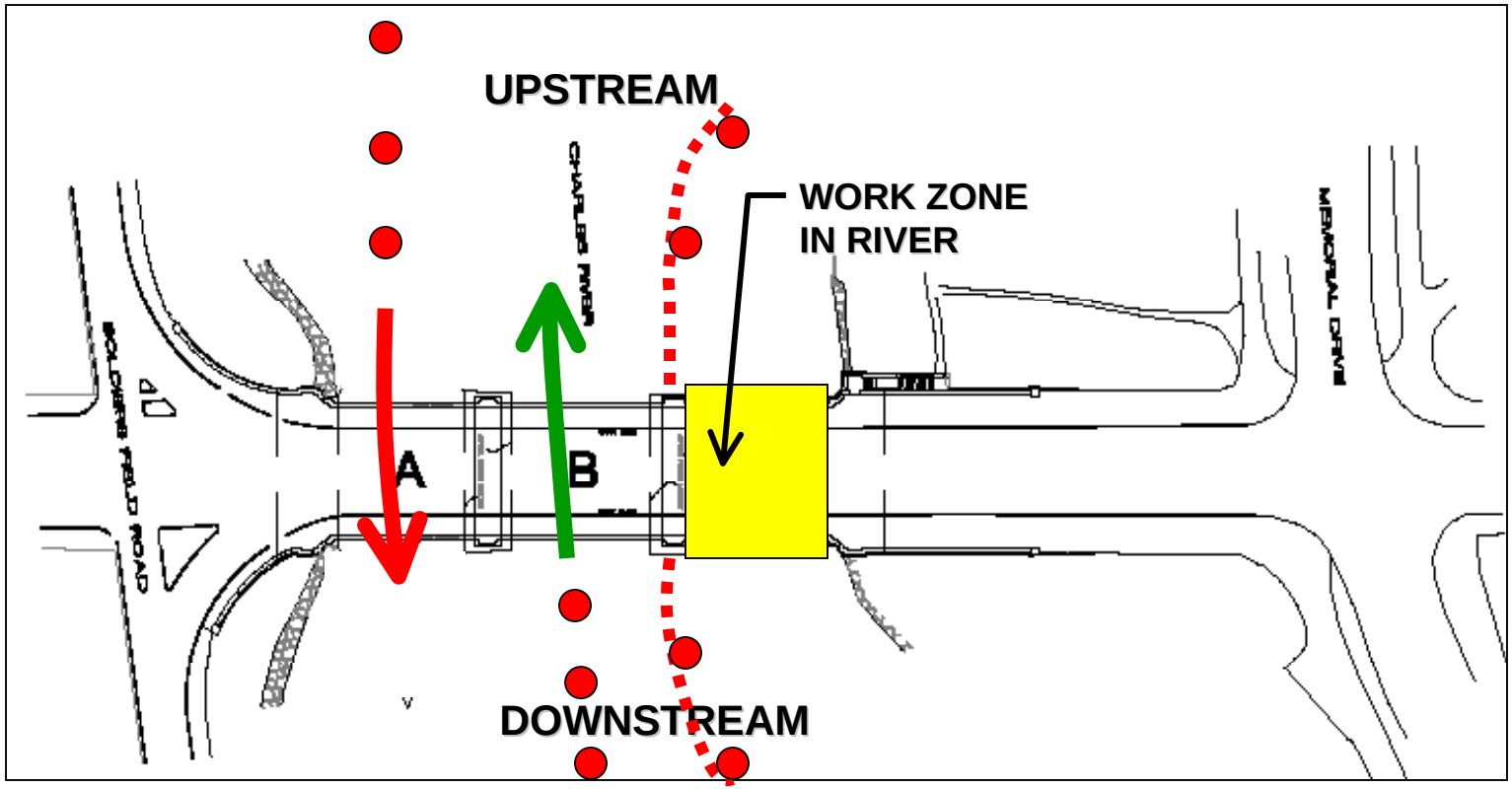
Construction Staging in the River

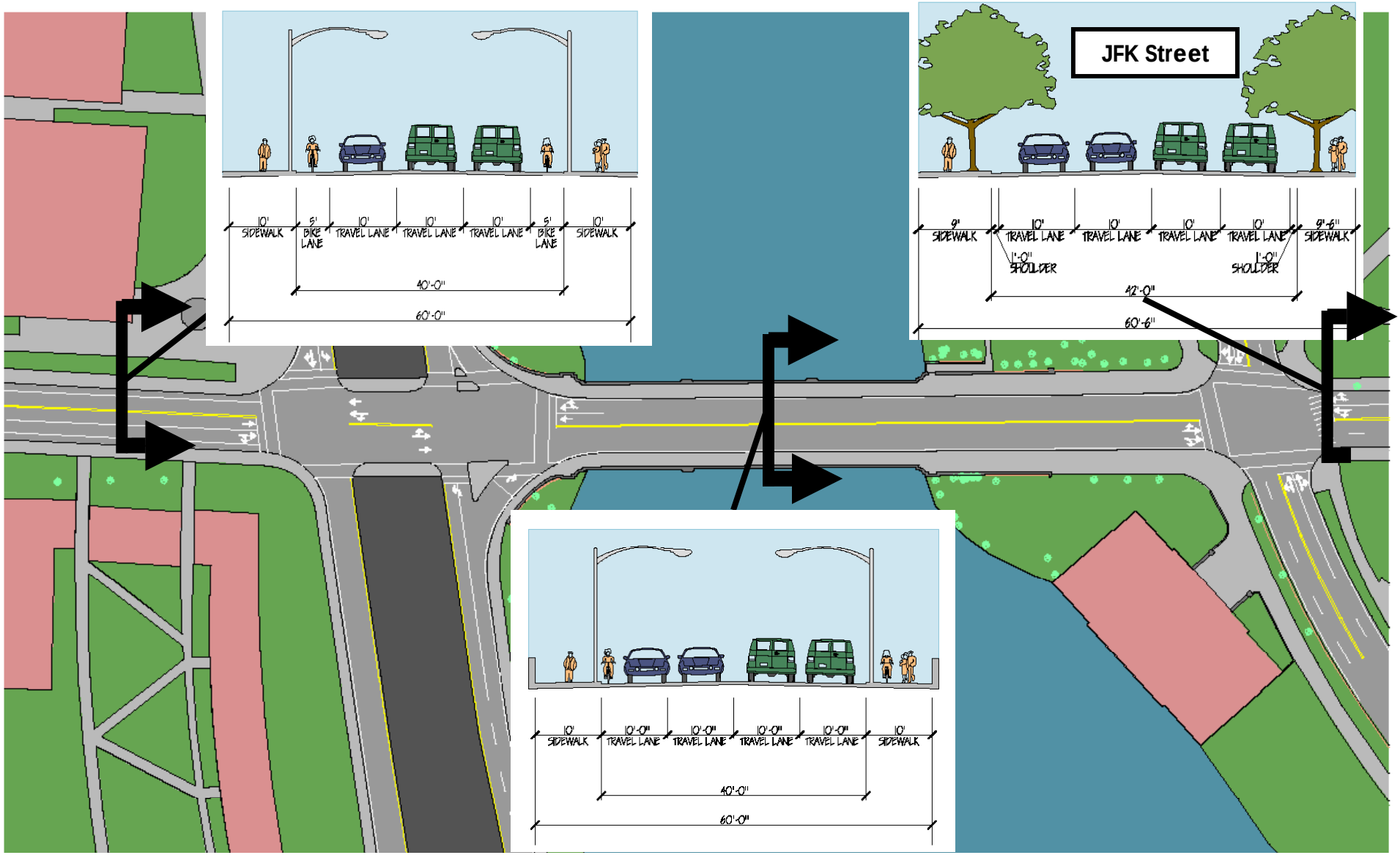
Existing Rowing Traffic Patterns



Construction Staging in the River

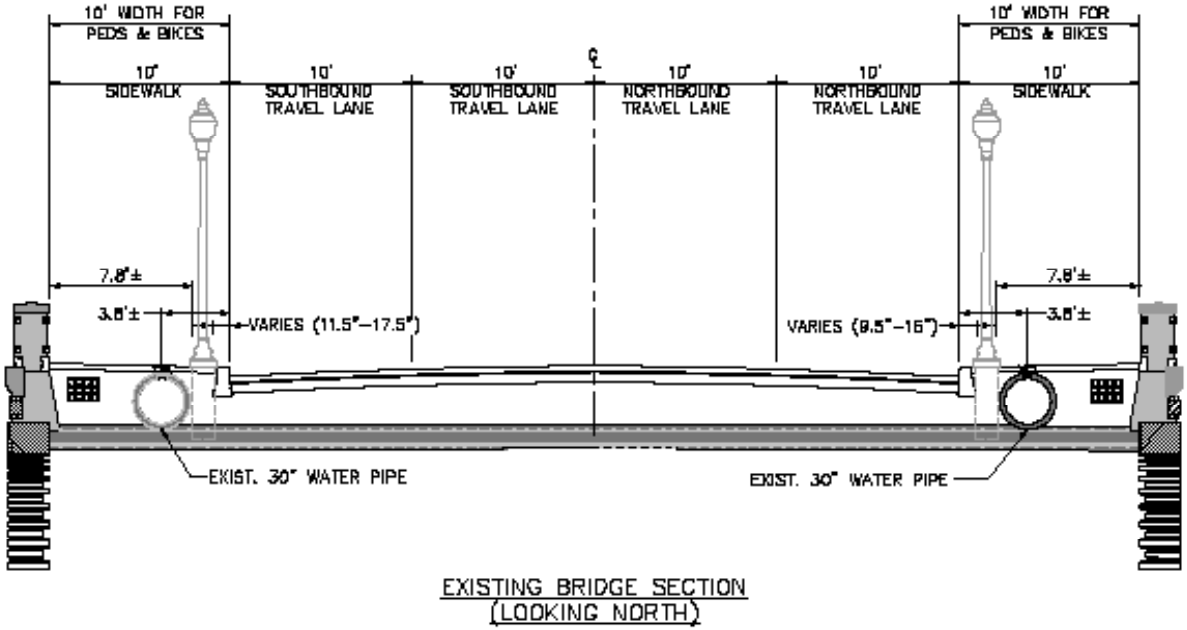
Warning Buoys Requirements





EXISTING ROADWAY SECTIONS

Existing Cross Section



EXISTING BRIDGE SECTION
(LOOKING NORTH)

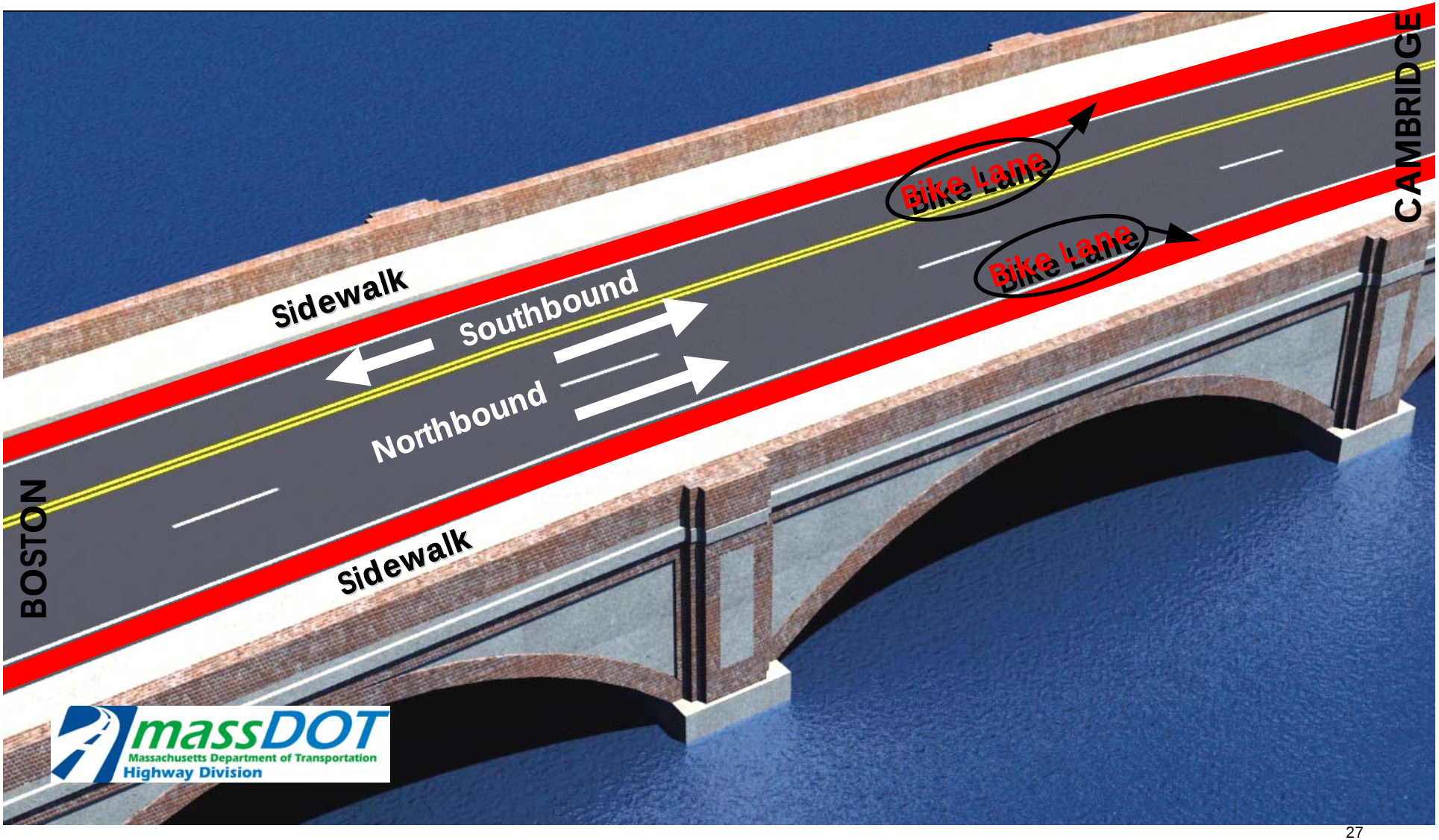
Existing Conditions

- 60 Foot Bridge Width
- 40 Foot Roadway Width (4 lanes)
- 2 – 10 foot Wide Sidewalks (For Pedestrians and Bicyclists)

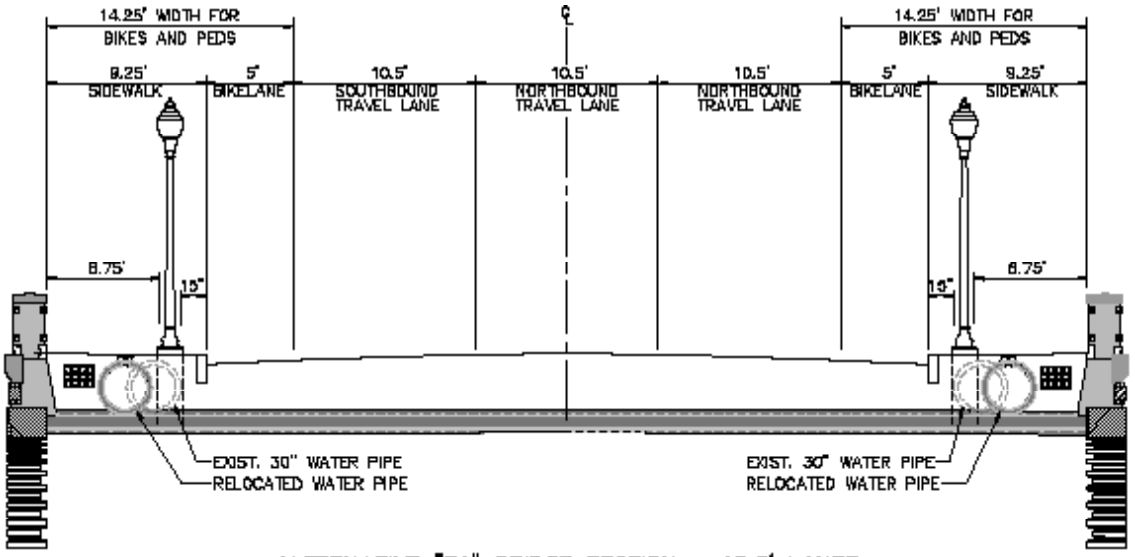
Volumes

- 1655/1810 VPH (AM/PM)
- 145/222 BPH (AM/PM)
- 355/877 PPH (AM/PM)

Proposed Roadway Section w/Bike Lanes



Proposed Cross Section



ALTERNATIVE "B1" BRIDGE SECTION – 10.5' LANES
(LOOKING NORTH)

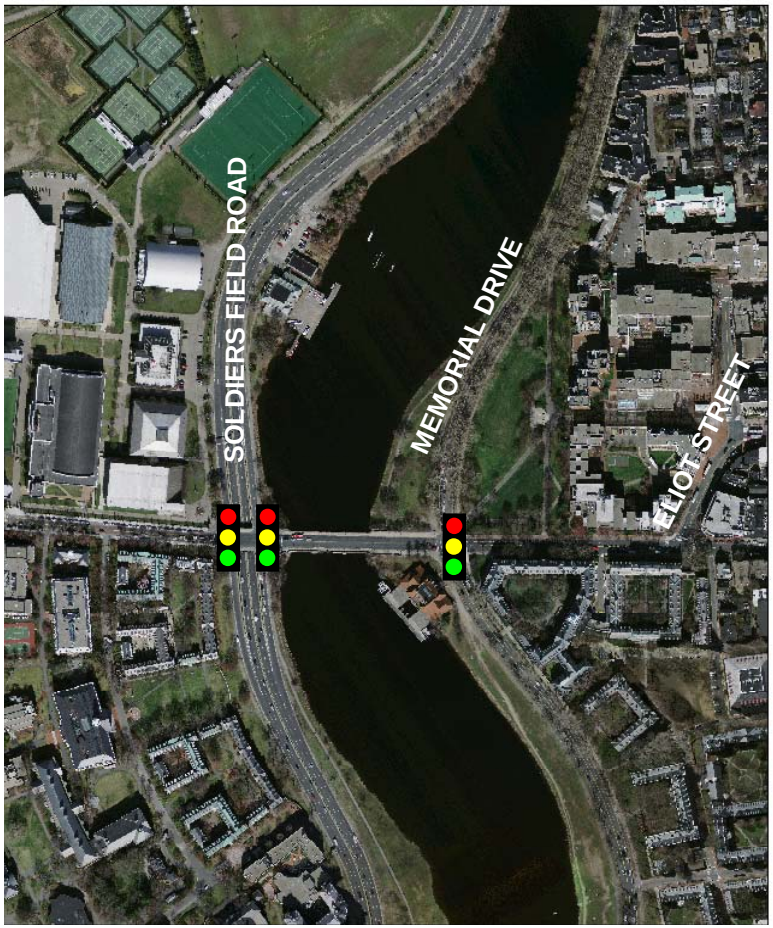
Existing Conditions

- 60 Feet Bridge Width
- 40 Feet Roadway Width (4 lanes)
- 20 Feet for Pedestrians and Bicyclists

Proposed

- 60 Feet Bridge Width
- 31.5 Feet for Vehicles (3 lanes)
- 28.5 Feet for Pedestrians and Bicyclists

Study Area


BOSTON
SOLDIERS FIELD ROAD
MEMORIAL DRIVE
ELIOT STREET
CAMBRIDGE

Traffic Analysis

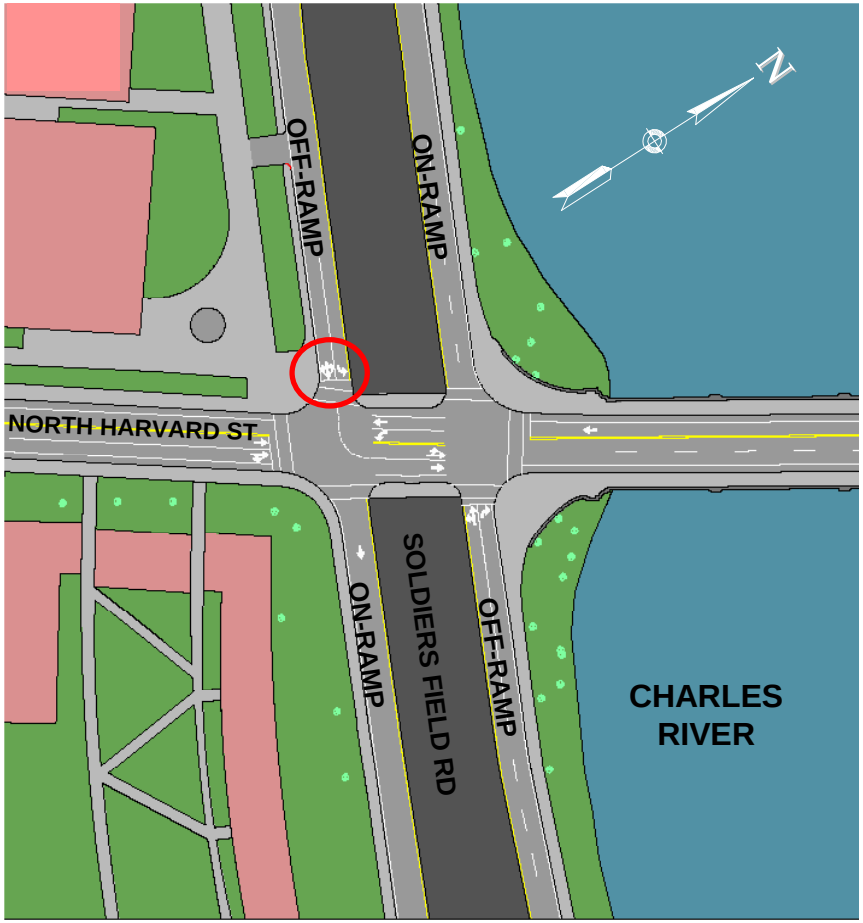
- **Traffic Analysis is based on:**
  - Future Traffic Volumes
  - Standard DOT Procedures
- **Includes:**
  - Pedestrian Crossings
  - Bicycle Accommodations
  - Peak and off-peak periods

Key Design Elements

- **Cross section approved by MassDOT**
  - Travel lane widths – Bike lane widths – Sidewalk considerations
- **Abutting intersections will require modifications**
  - Memorial Drive/JFK Street
  - North Harvard Street/Soldiers Field Road (2 Locations)
- **Revised Traffic Signals**
  - Timing and phasing
  - Pedestrian crossing accommodations
  - Bike crossing accommodations
- **Accessibility**
  - ADA

Proposed Improvements

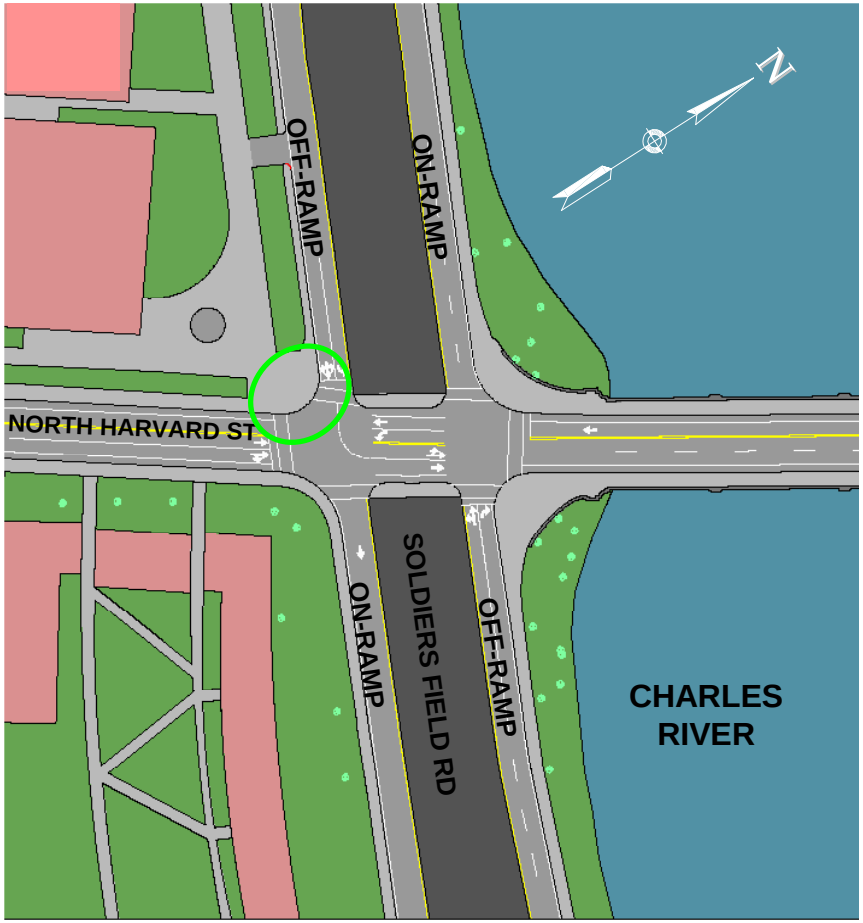
Soldiers Field Road/North Harvard Street



- Add additional turn lane opportunity on Soldiers Field Road eastbound off-ramp to North Harvard St northbound

Proposed Improvements

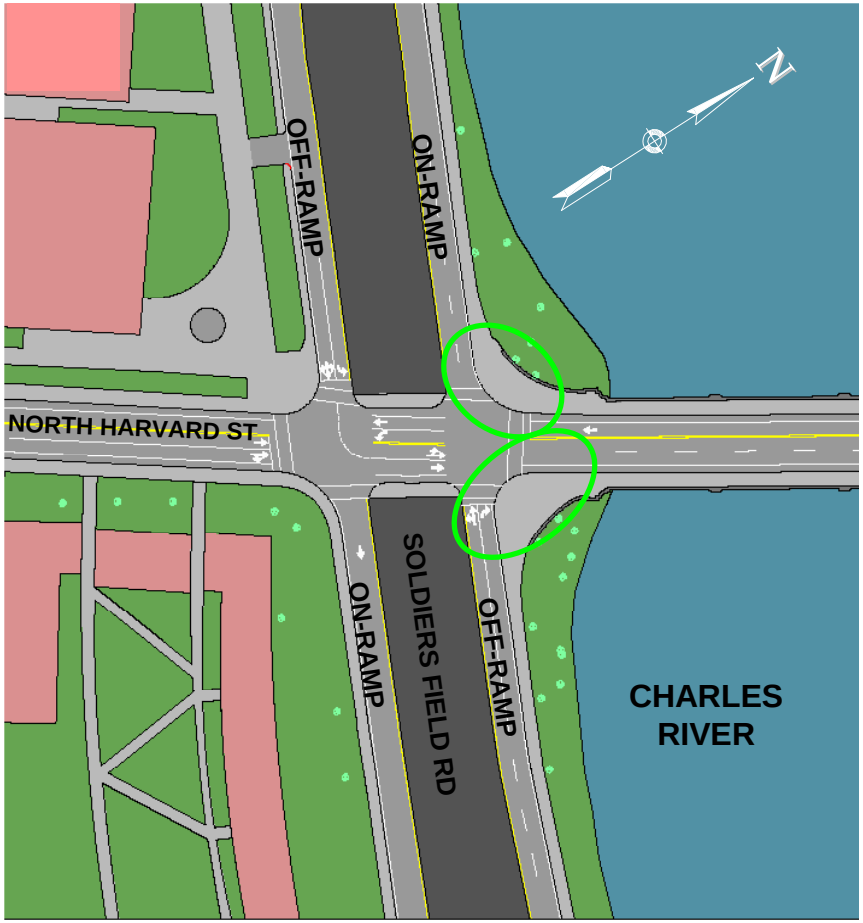
Soldiers Field Road/North Harvard Street



- Add additional turn lane opportunity on Soldiers Field Road eastbound off-ramp to North Harvard St northbound
- Improve corner radius for enhanced pedestrian mobility

Proposed Improvements

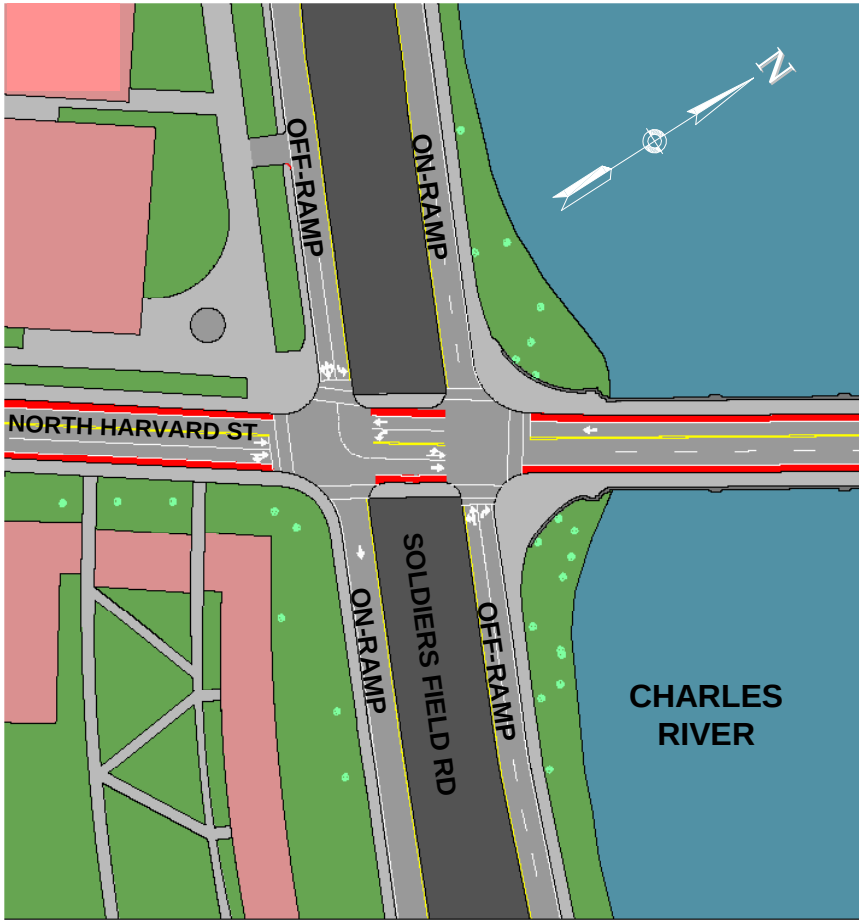
Soldiers Field Road/North Harvard Street



- Add additional turn lane opportunity on Soldiers Field Road eastbound off-ramp to North Harvard St northbound
- Improve corner radius for enhanced pedestrian mobility
- Eliminate raised "Delta" islands at Soldiers Field Rd westbound on and off-ramp and widen corner curb

Proposed Improvements

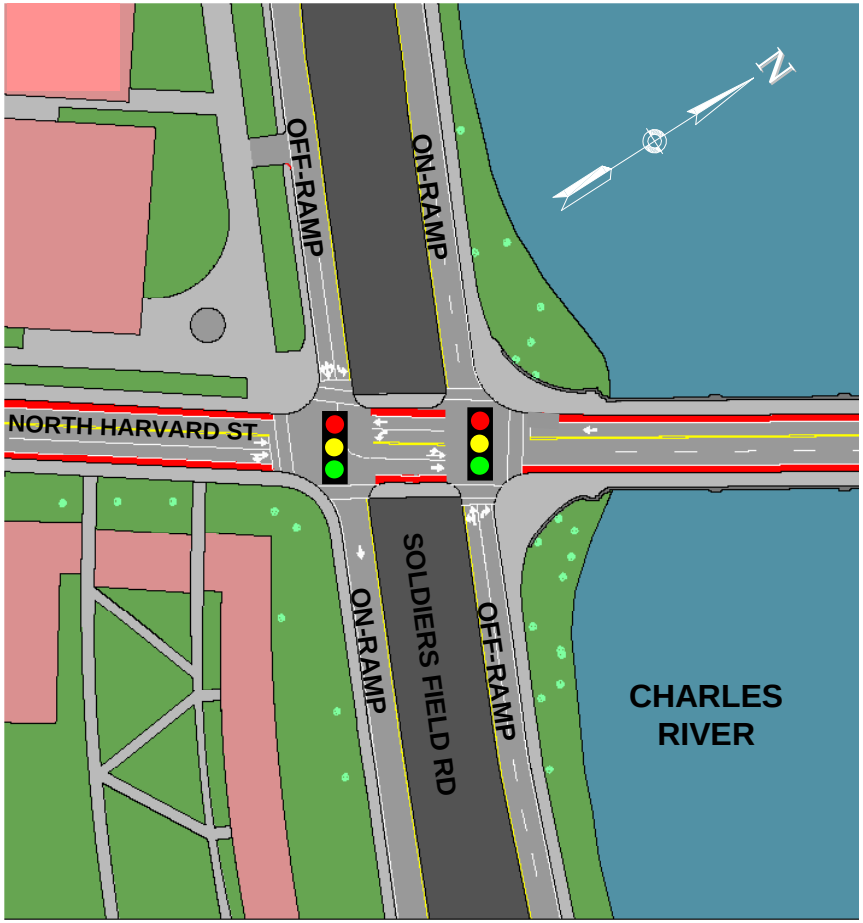
Soldiers Field Road/North Harvard Street



- Modify bridge cross section to include bike lanes, 1 southbound lane, and 2 northbound lanes

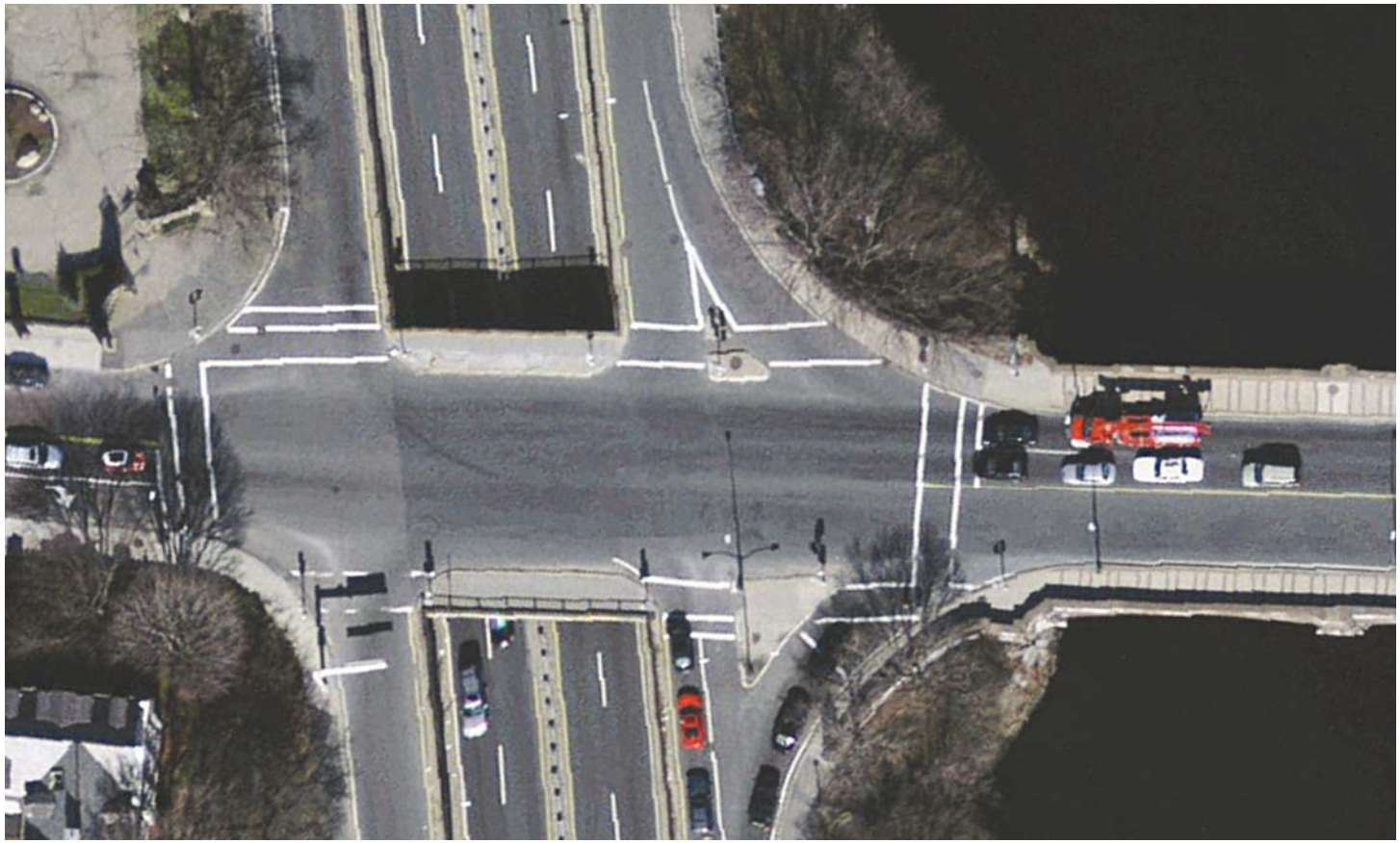
Proposed Improvements

Soldiers Field Road/North Harvard Street

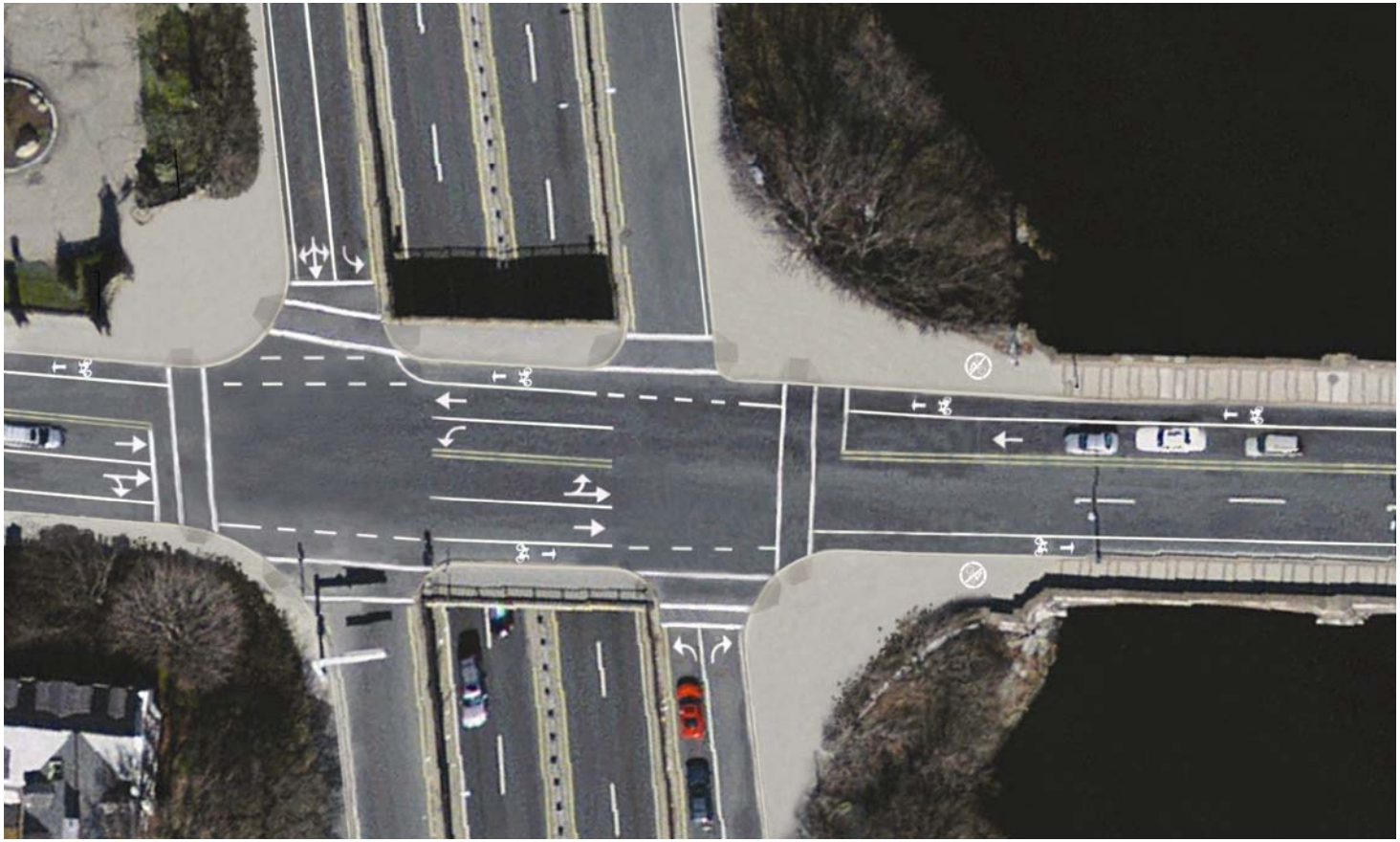


- Modify bridge cross section to include bike lanes, 1 southbound lane, and 2 northbound lanes
- Modify signal timing, phasing, and upgrade traffic signal to include leading pedestrian intervals

Proposed Improvements
Soldiers Field Road/North Harvard Street



Proposed Improvements
Soldiers Field Road/North Harvard Street



Existing Conditions

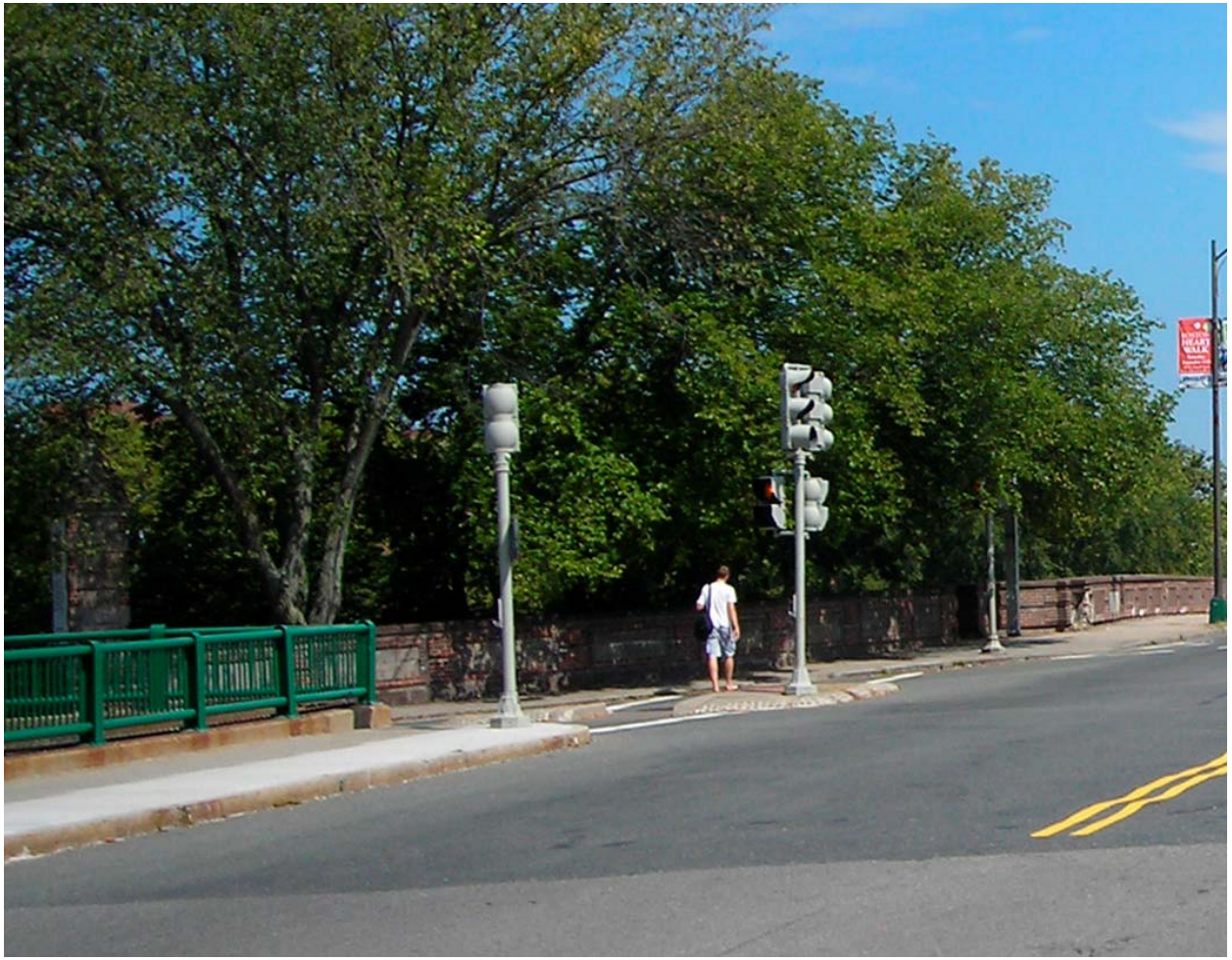
Soldiers Field Road/North Harvard Street

Proposed Improvements

Soldiers Field Road/North Harvard Street

Existing Conditions

Soldiers Field Road/North Harvard Street



Proposed Improvements

Soldiers Field Road/North Harvard Street

Existing Conditions

Soldiers Field Road/North Harvard Street

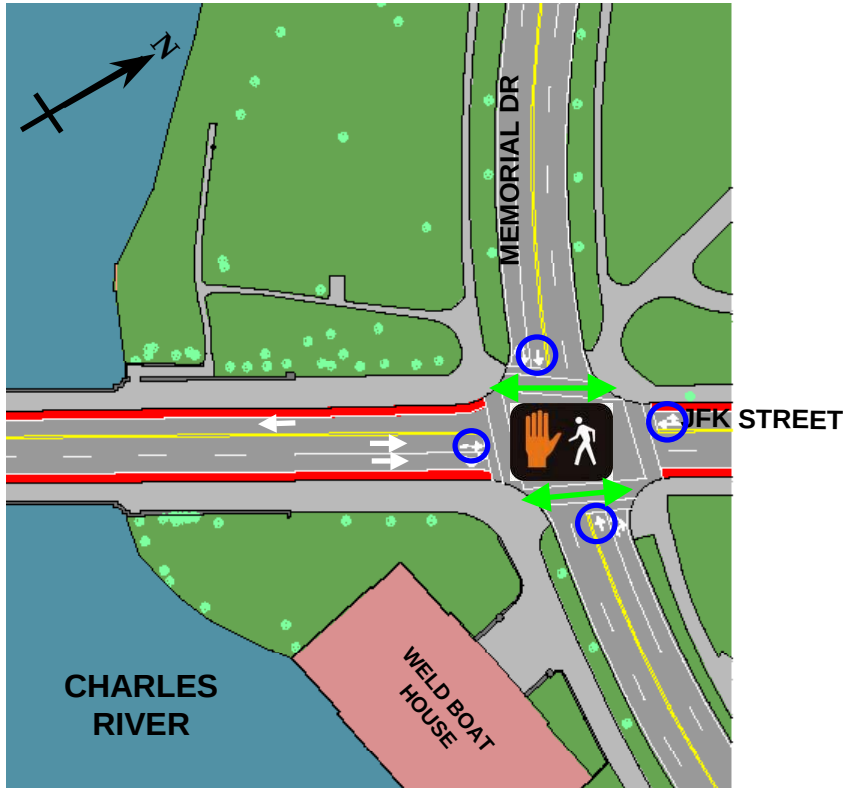
Proposed Improvements

Soldiers Field Road/North Harvard Street

Improved Pedestrian Access

Proposed Improvements

Memorial Drive/JFK Street



- Prohibit left turns
  - Both Memorial Drive left turns
  - JFK Street southbound left turns
  - North Harvard northbound lefts
- Modify bridge cross section to include bike lanes, 1 southbound travel lane, and 2 northbound travel lanes
- Implement concurrent pedestrian phasing and LPI, rather than exclusive phasing used today
- Modify traffic signal timing and phasing and upgrade equipment

Advantages of Transportation Improvements

Mode	Measure	Benefit
Pedestrians	Concurrent phasing and leading pedestrian interval	LPI allows pedestrians to start crossing before moving traffic. Concurrent phasing reduces the wait for the walk and lengthens the walk phase
	Elimination of raised delta islands at Soldiers Field Rd	Shorter crossing times, narrower crossing widths and less conflicts with vehicles
	Smaller corner radii at Soldiers Field Rd	Improved pedestrian crossing area
Bicycles	Dedicated north and south bike lanes added on Anderson Bridge	Removes bikes from sidewalks and eliminates conflicts with pedestrians. Bikes no longer share travel lane with vehicles
	Striped bike lanes	Provides connectivity with North Harvard Street and JFK Street
	Relocated pedestrian signal	Provides connectivity with bike path
Vehicles	Prohibited left turns at Memorial Drive/JFK St	Will eliminate left turn conflicts between vehicles and pedestrians and bicyclists. Reduce crashes. Shorten the vehicle queues. Allow the bridge to efficiently process the vehicle volume with the new cross section
	Interconnected and coordinated traffic signals at Storrow Drive and Soldier's Field Road	Improved vehicle operations and reduction in vehicle queues
	Upgraded signal timing and phasing	Reduced vehicle delays and queues

Stormwater Improvements

- **Existing roadway drainage directly discharges to the Charles River**
- **Opportunity to improve water quality and minimize impacts of stormwater runoff**
- **Address objectives of:**
  - **MassDOT Impaired Waterbodies Program**
  - **Lower Charles River Total Maximum Daily Load (TMDL) Implementation Plan**
  - **DEP Stormwater Management Standards**

Stormwater Improvements

Best Management Practices (BMPs)

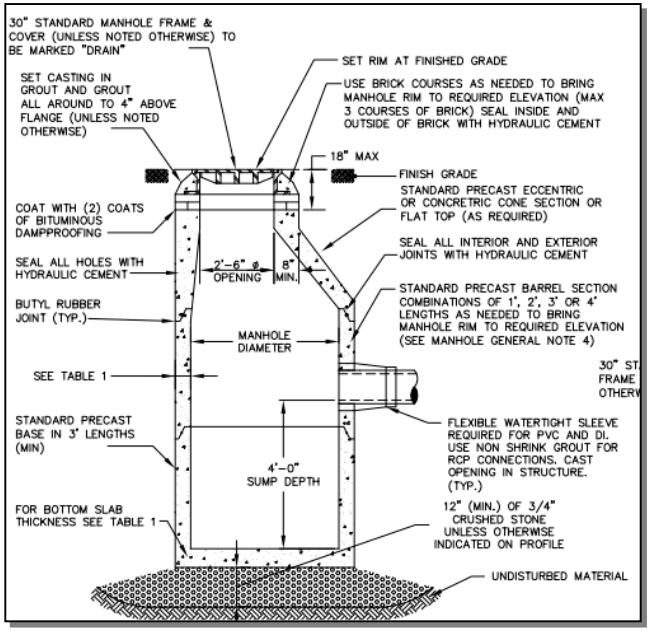
BMP selection & siting considerations:

- Site constraints
  - Topography
  - Depth to groundwater
  - Space requirements
- Physical setting
  - Historic landscape
  - Existing land uses
- Maintenance requirements
- Pollutant removal efficiencies

Stormwater Improvements

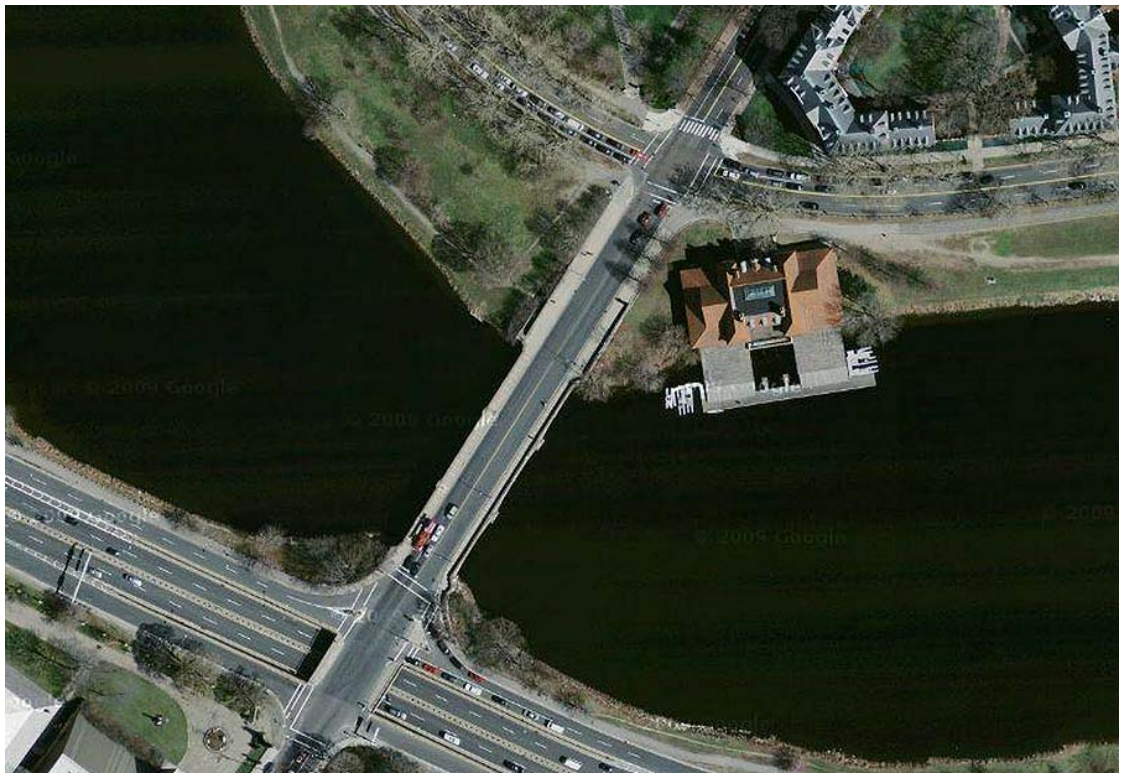
Types of Stormwater BMPs

- Structural Pretreatment
- Additional On-Site Treatment



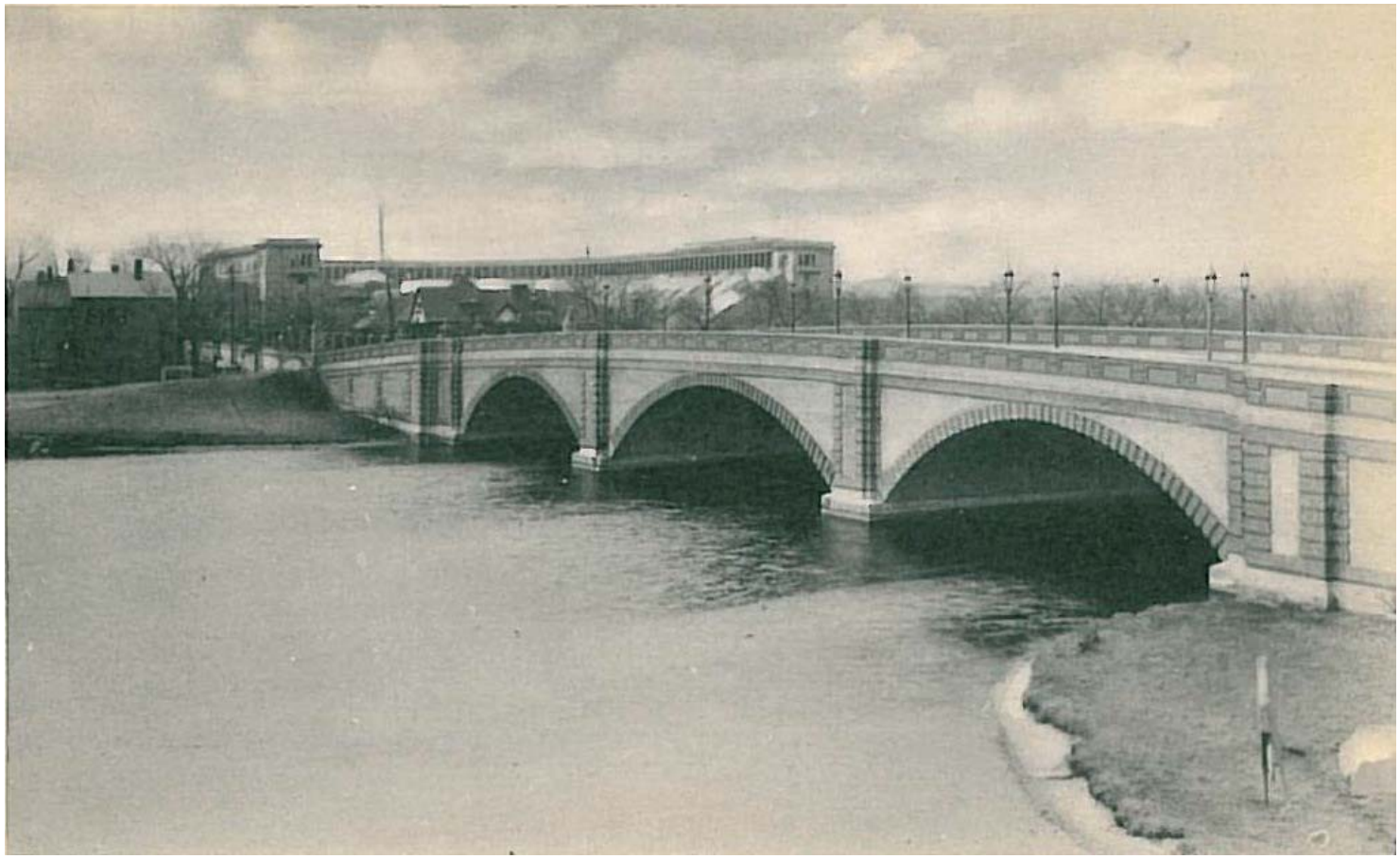
Landscape Restoration

Existing Conditions



Restore park landscape after bridge rehabilitation and stormwater treatment in manner consistent with goals of DCR Master Plan for the Charles River Basin.

Landscape Restoration



In 1915, park users had clear views to bridge and grassy banks.

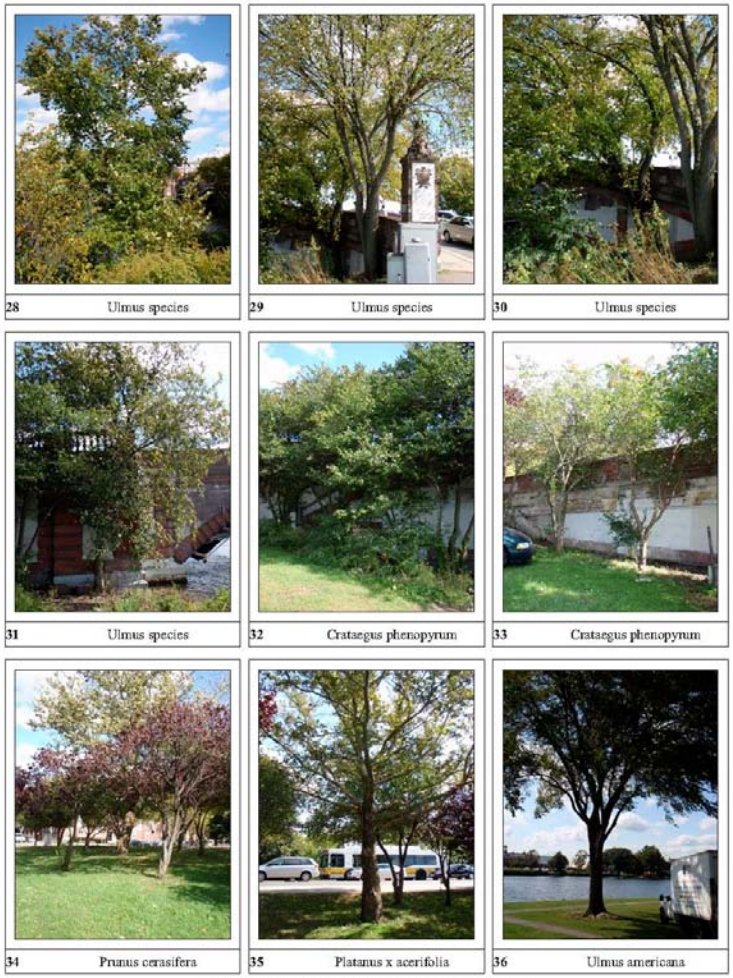
95 years later – Tree Inventory

Trees have been planted over time.

Invasive trees such as Norway Maple, Common Buckthorn and Mulberry have seeded themselves, as have native trees such as Elms and Crabapples.

Trees now grow at bridge foundation, in armor stone, in riprap along river.

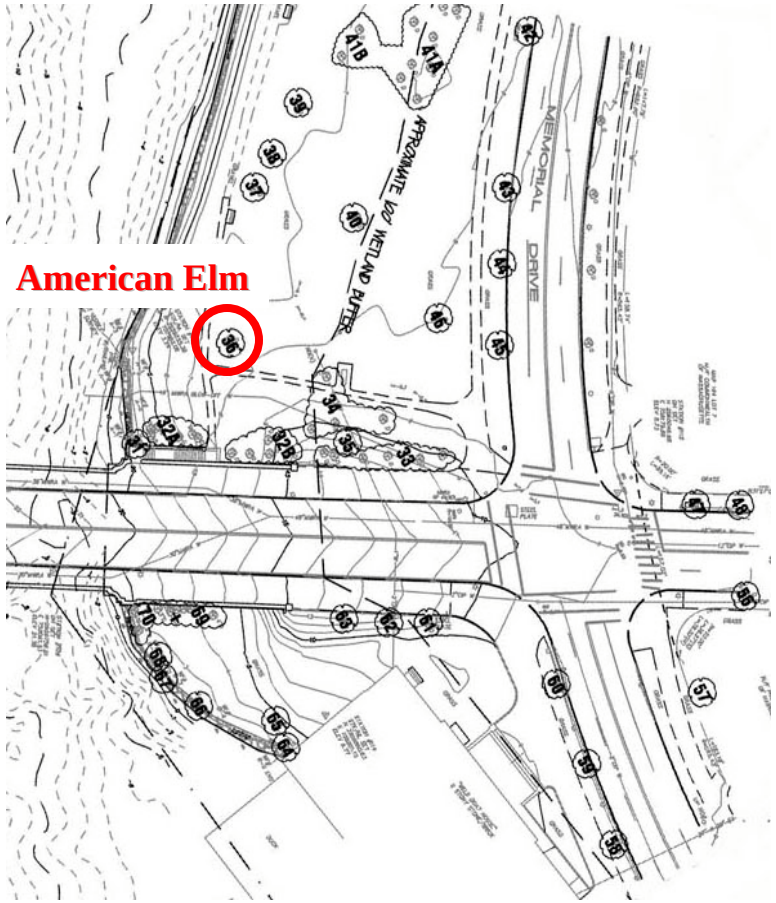
Their condition ranges from poor to good. Dead limbs and compacted soil compromise health of some of the trees.



Larz Anderson Bridge Rehabilitation Project
Inventory of Existing Trees

Special Trees

American Elm,
Ulmus americana



This elm is one, among many examples, of a special tree that requires protection.

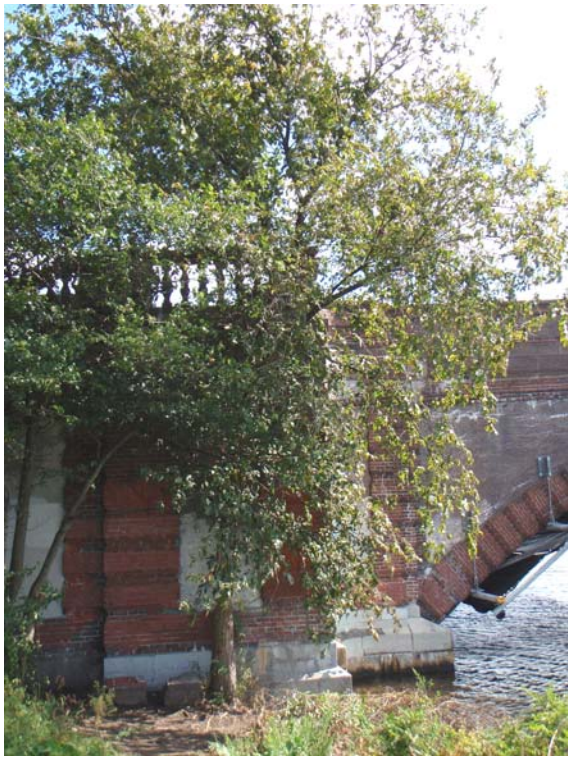
Proposed Tree Protection Method

Install tree protection fencing at edge of drip line.

Attach 8’ high 2”x4” lumber to tree within the fenced area.

Trees considered for removal

Location at Bridge Foundation



Elm

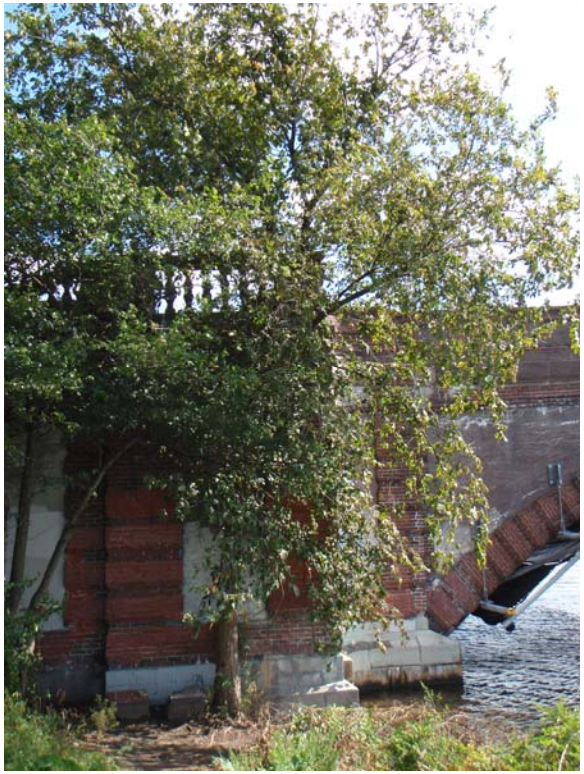
Construction Staging

Kwanzan Cherries

Public Safety Concerns

Hawthorns

Trees considered for removal



Elm species

Hawthorn

Some trees at the base of the bridge damage foundation and structure, interfere with repair and create hiding places.

Tree considered for removal

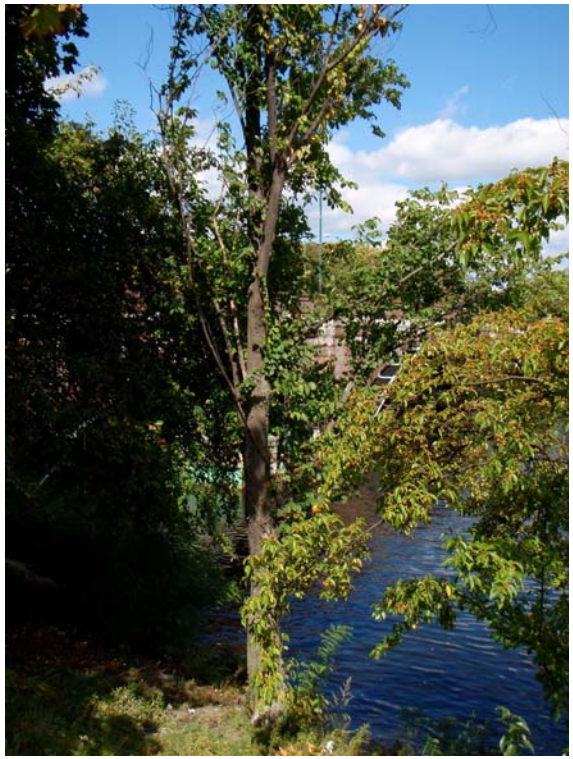
Fair / Poor Condition

Volunteer Invasive

Volunteer Non-Invasive

Sugar Maple

White Mulberry



Elm

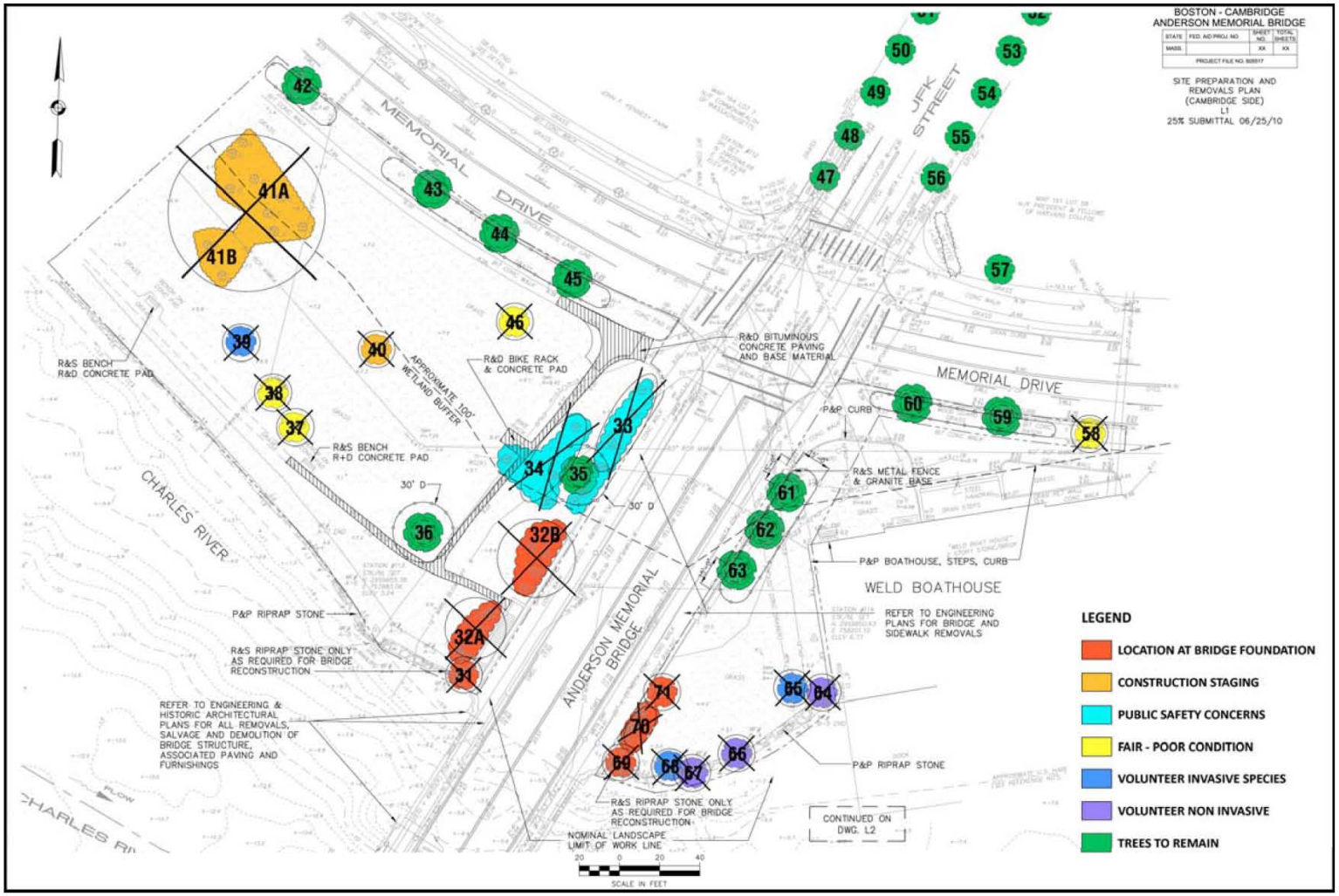
Trees to be Protected

Existing Trees

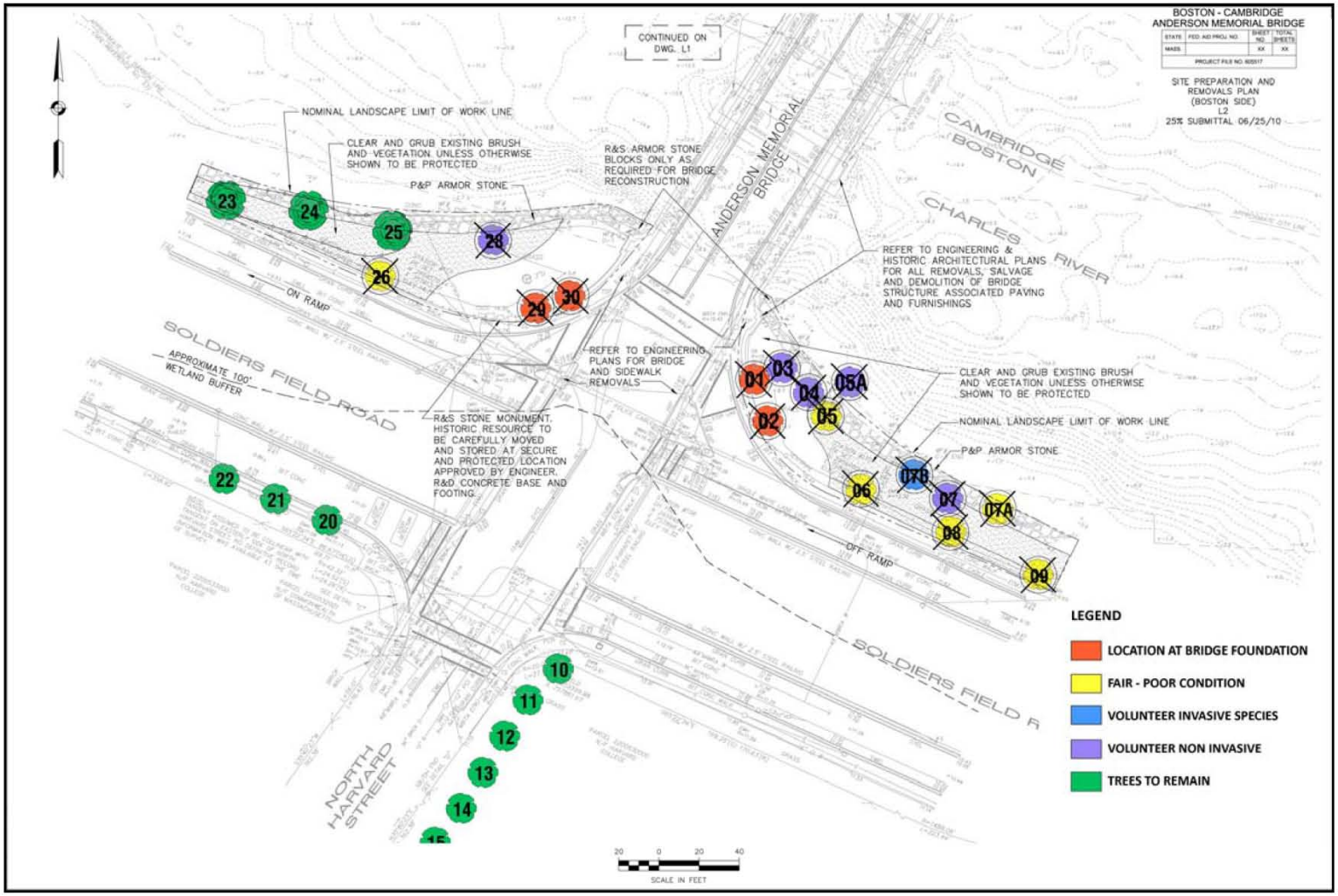
Elm

American Sentry Linden

Trees in Cambridge

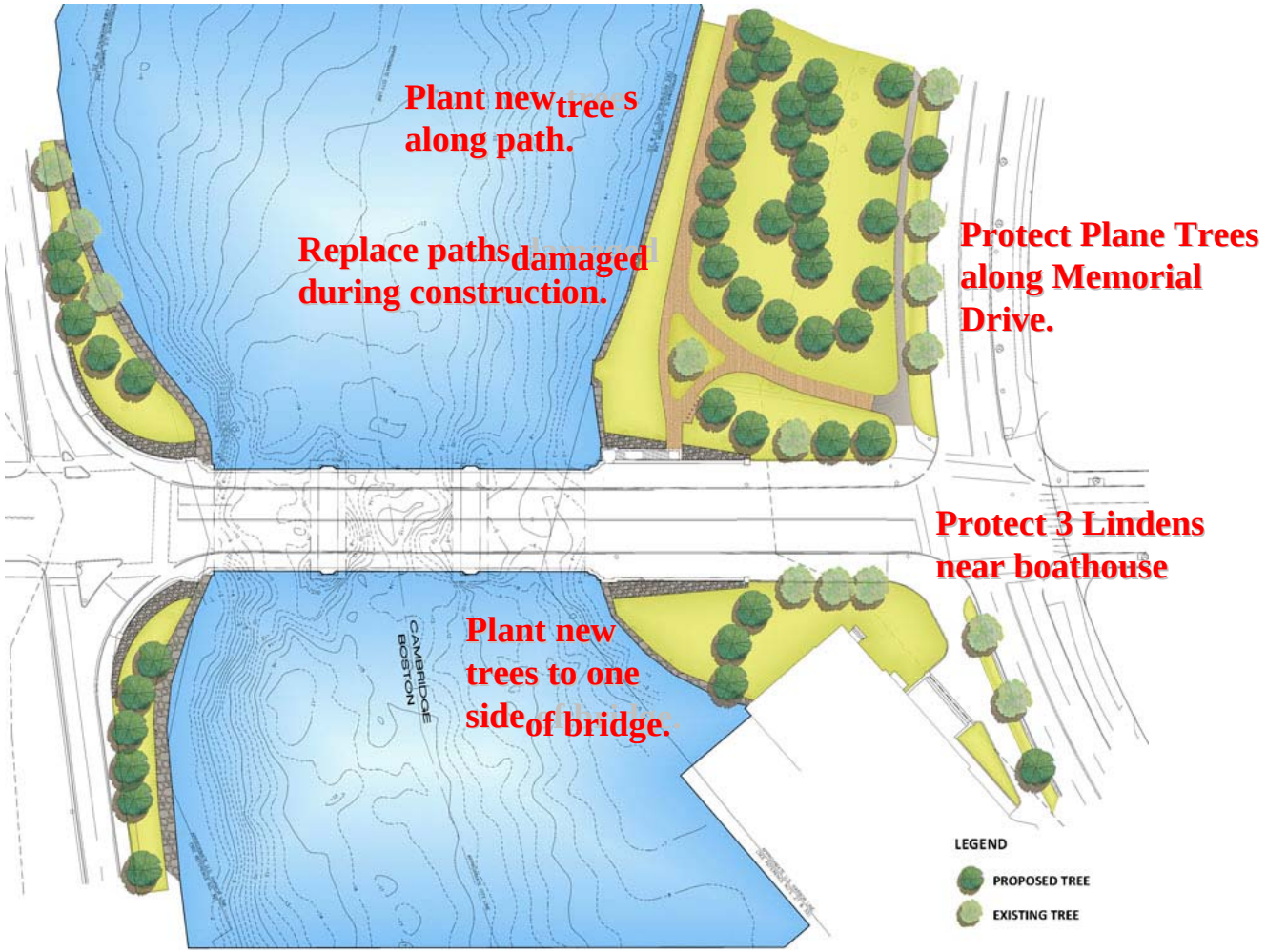


Trees in Boston



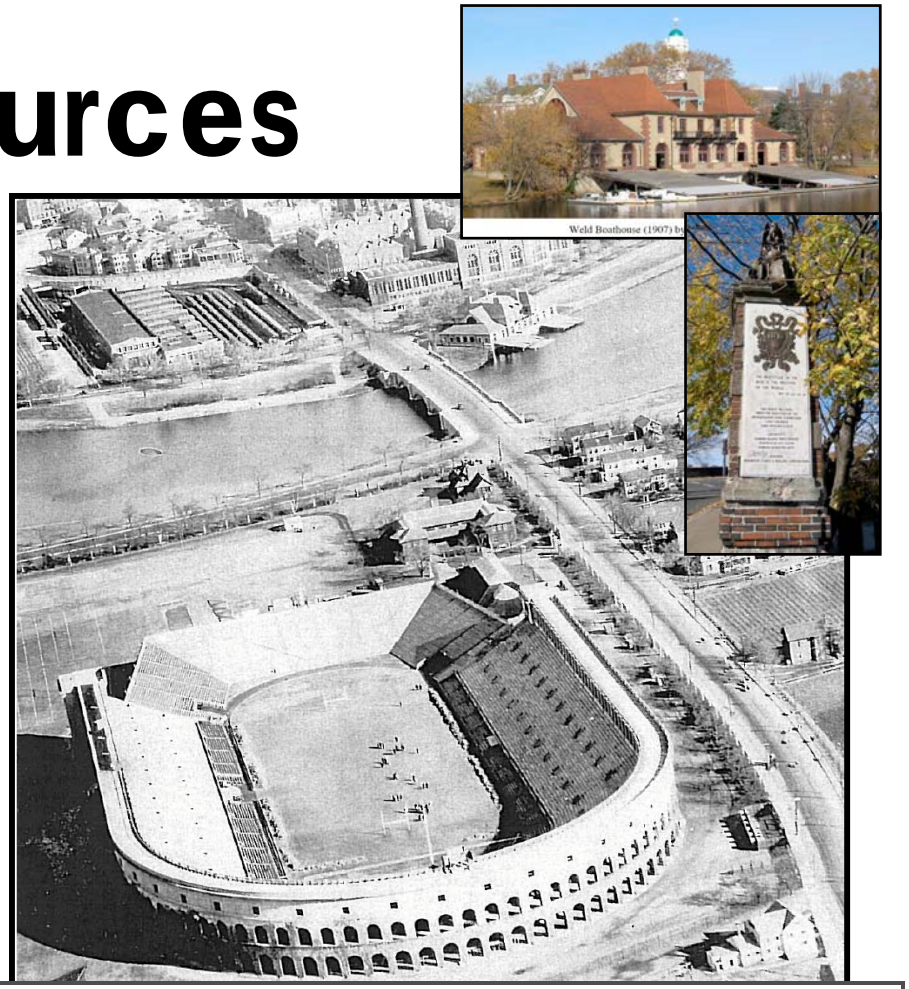
Landscape Restoration

- Plant new deciduous shade trees to replace trees that need to be removed in order to rehabilitate bridge.
- Protect trees to remain.
- Aerate soil.

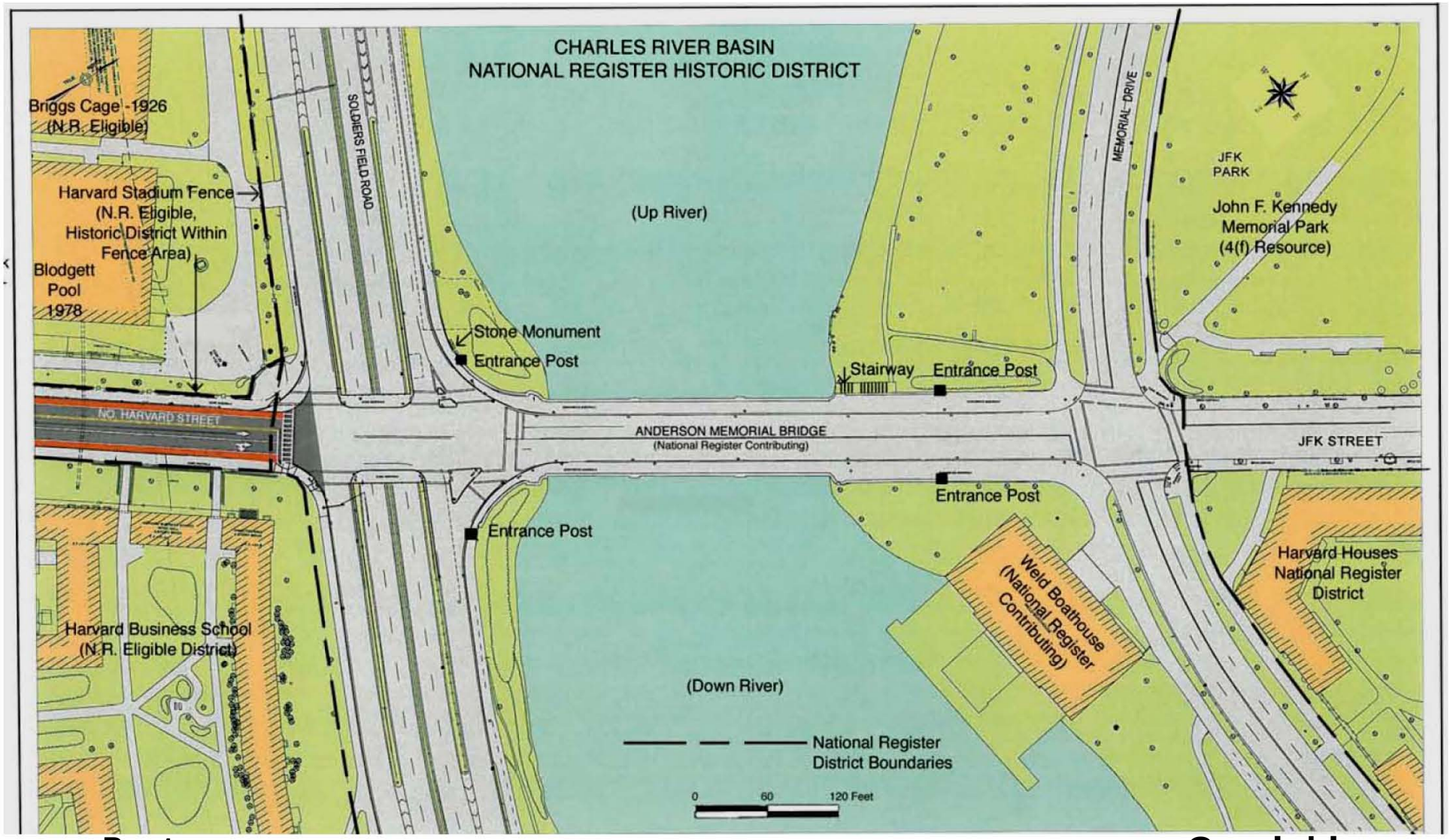


Cultural Resources

- **Entire Area has Historic Significance**
  - Charles River Basin – National Register Historic District
  - Anderson Memorial Bridge
  - Area buildings and structures
  - JFK Memorial Park
- **Rehabilitation must meet the '*Standards for the Treatment of Historic Properties*'**



This is the site of the "Great Bridge" (opened in 1662) which was considered the first bridge of consequence built in America.

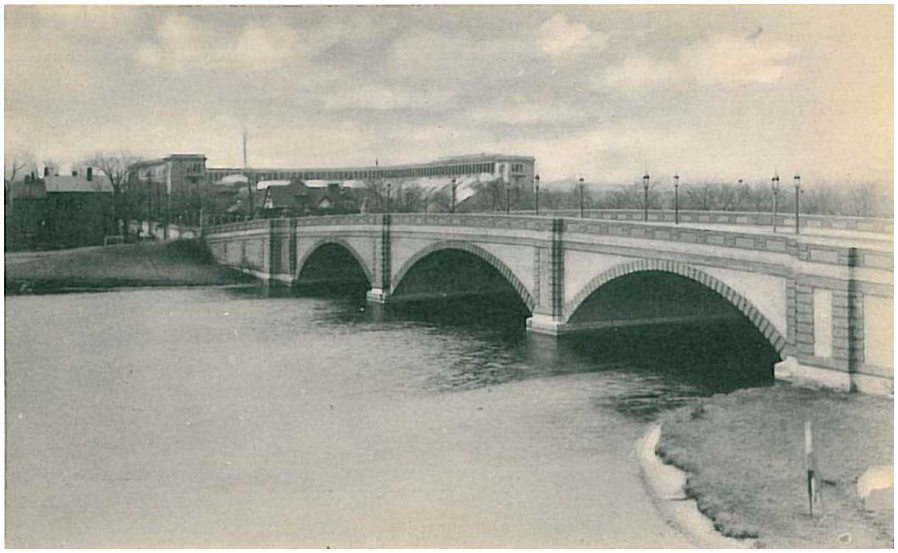


Boston **Cambridge**

Cultural Resources Identification Map

Proposed Treatment of Architectural Details

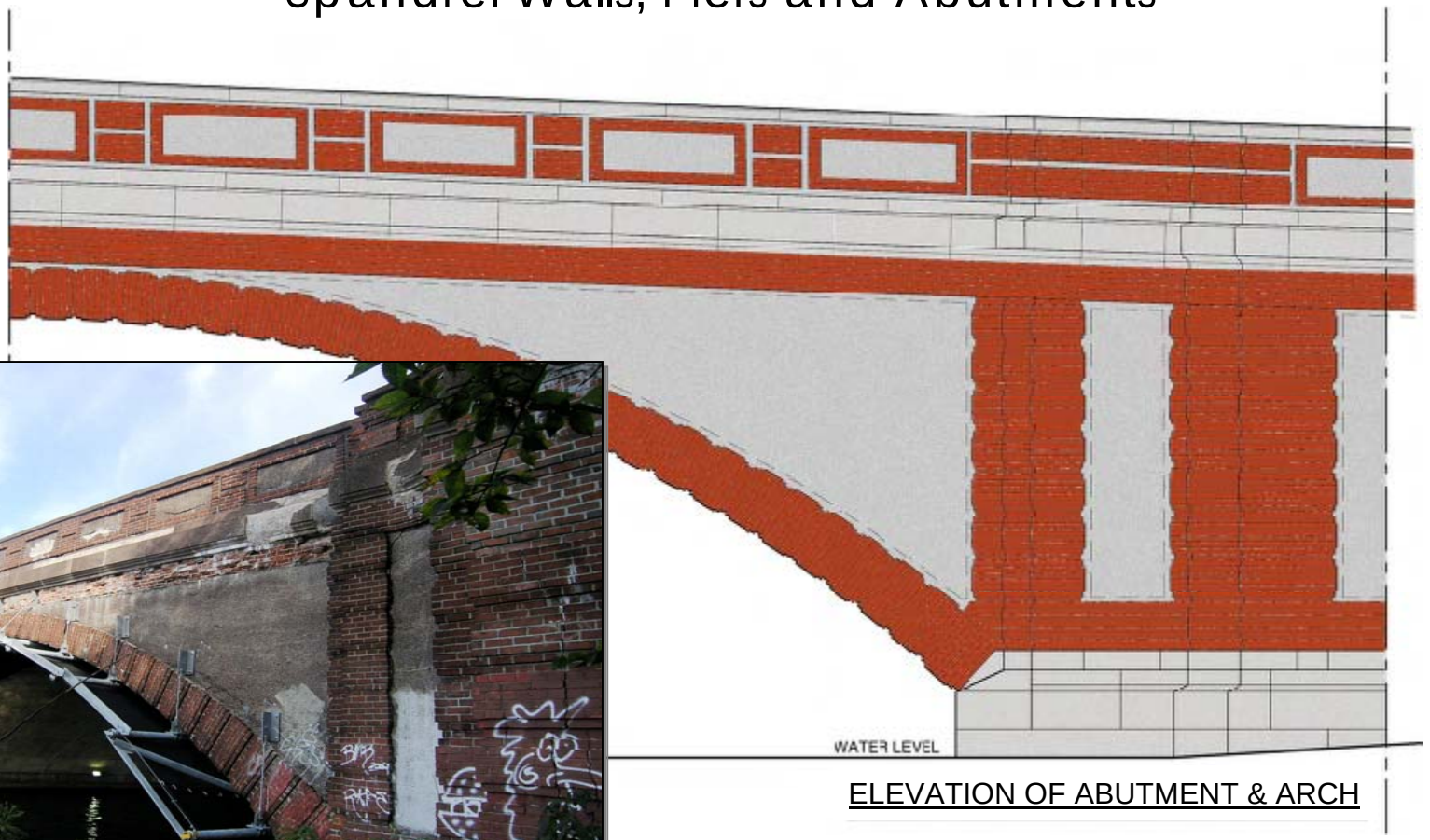
- **Rehabilitation and Restoration Wherever Possible**
  - Concrete Masonry Arches
  - Memorial Marble Tablets and Bronze Sculpture
- **Replication of Original Details Where Rehabilitation is Not Feasible**



ca. 1915 Historic Postcard View

Architectural Details

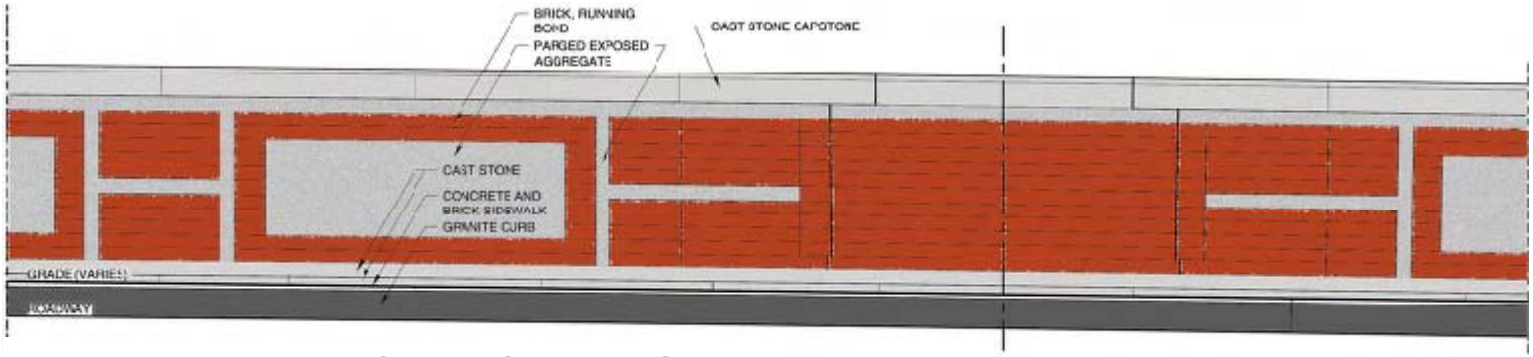
Spandrel Walls, Piers and Abutments



ELEVATION OF ABUTMENT & ARCH

Architectural Details

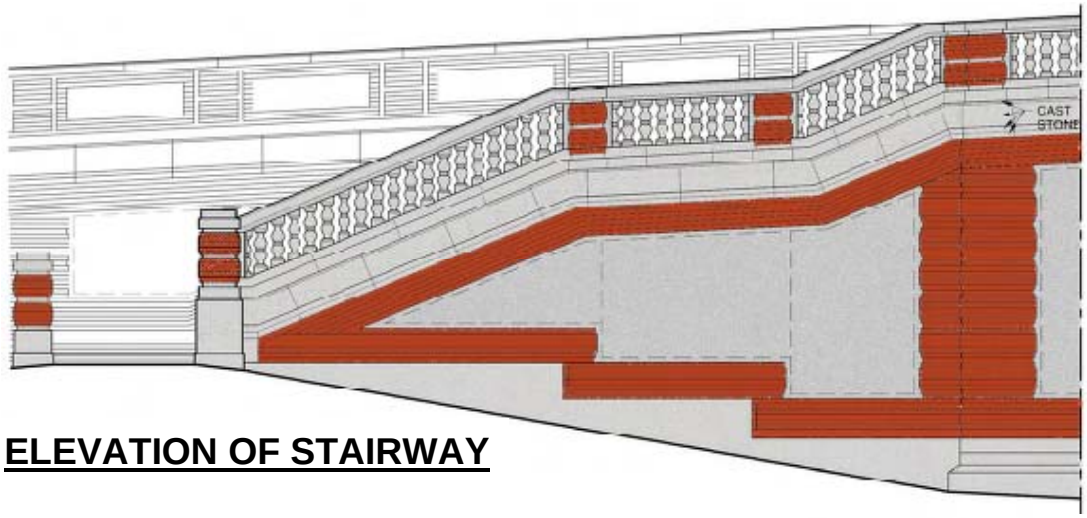
Parapet Walls



PARAPET ELEVATION AT STREET SIDE

Architectural Details

Stair on Cambridge Side



ELEVATION OF STAIRWAY

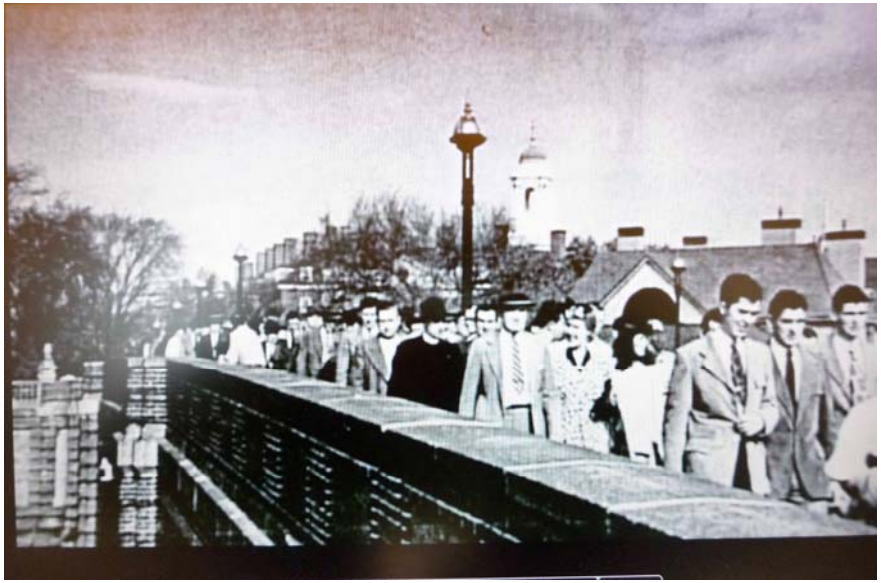
EXISTING DETERIORATED CONDITIONS

Architectural Details

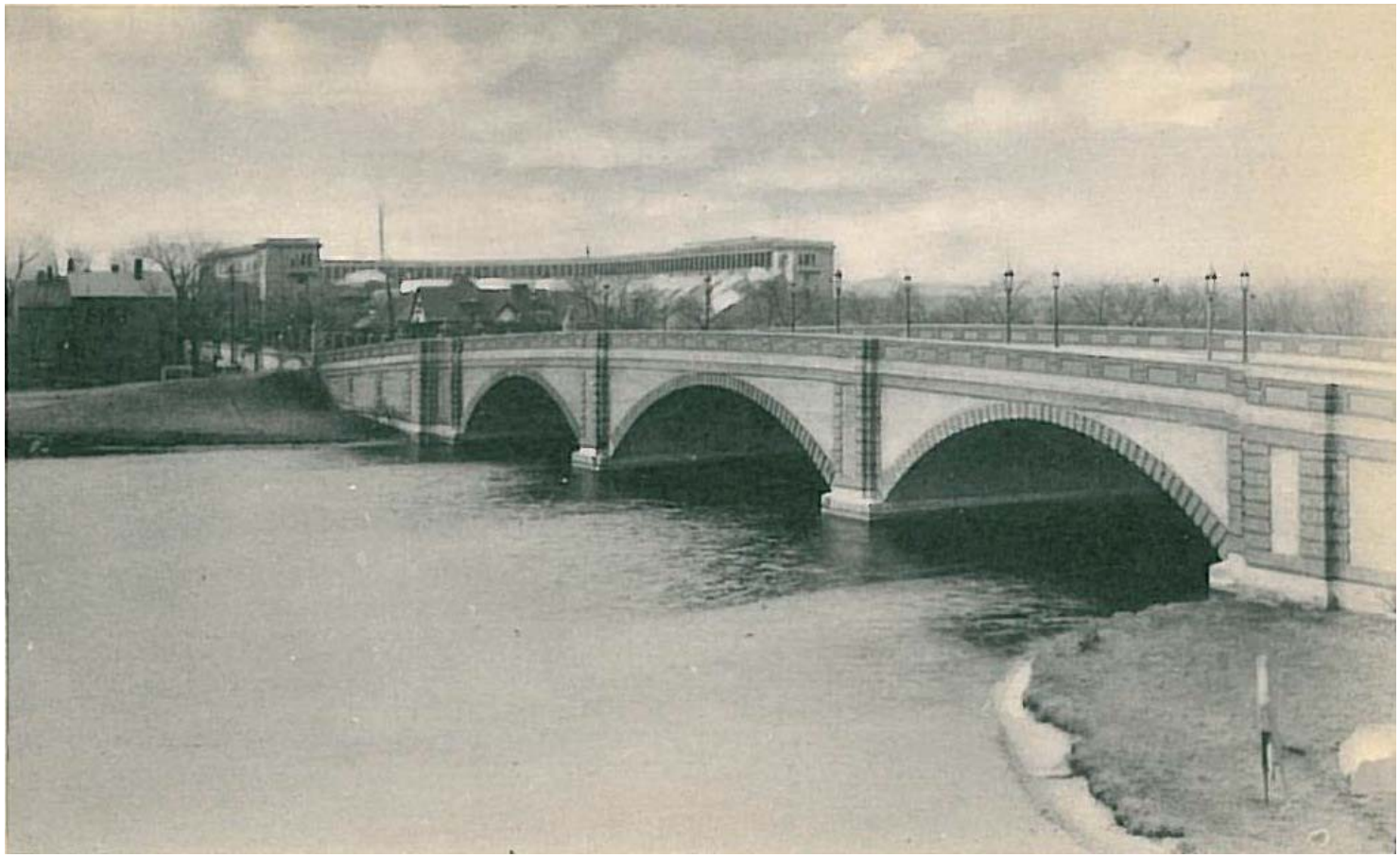
Entrance Posts, Memorial Tablets and Sculpture

Architectural Details

Street Lighting – Historic Photos



Anderson Memorial Bridge



ca. 1915 Historic Postcard

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Discussion